



# COMPUTER WEEKLY

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This month marks the tenth anniver-  
sary of the shooting of Andy Warhol  
by Valerie Solanas, for whom SCUM  
stood for Society for Cutting Up  
Men. In this Guest Computerview,  
Professor DONALD MICHIE, of the

Machine Intelligence Unit at Edin-  
burgh University, warns that, when  
people are chronically and massively  
deprived of jobs, the same moods of  
alienated frustration as those ex-  
pressed in Valerie Solanas' SCUM

Manifesto could build up quickly  
with terrorism, racial slaughter and  
war not excluded in some social  
circumstances. SCUM would then  
stand for the Society for Cutting Up  
Machine-makers. . . .

## Beware SCUM—the Society for Cutting Up Machine-makers

WATCH out for SCUM! I am not  
referring to the latest oil slick.  
The acronym SCUM was origi-  
nally coined in New York by the  
tragic paranoid Valerie  
Solanas who, on June 3, 1968,  
shot Andy Warhol.

For her, SCUM stood for  
Society for Cutting Up Men.  
With brilliant intensity her  
SCUM Manifesto propounded  
the bold idea of exterminating  
the male of the human species,  
thus freeing the world's women  
to develop their own destinies.  
Her idea was to fill the gap with  
machines.

My mind went back to poor  
Valerie's diatribe while reading  
Colin Hines' "The Chips are  
Down (25p from 40 James Street,  
London, W.1) published recently  
by Earth Resources Research  
Ltd. I realised that a new kind of  
craziness may one day be  
sparked off — not man-hating  
but machine-hating. In seven  
terse and sombre pages the au-  
thor warns that computer-  
induced mass unemployment  
may attain disaster proportions  
in Britain, and certainly will do  
so if a major national effort to  
analyse and cope is not  
mounted.

Hines argues that it is the  
microprocessor which is sud-  
denly turning dreams into  
threatening reality.  
What happens when people  
are chronically and massively  
deprived of jobs? My reading of  
history is that the very same  
moods of alienated frustration  
as those expressed in SCUM can  
build up quite quickly with ter-  
rorism, mass hooliganism, racial  
slaughter, and war not excluded  
in some social circumstances, as  
final outlets. SCUM this time  
will stand for Society for Cutting  
Up Machine-makers.

Luddism never yet turned  
back the industrial clock. So  
other responses will have to be  
found to such facts as the fol-  
lowing:

- Micro-automation has  
already shattered the Swiss  
watch industry.
- In 1970-75, National Cash  
Register reduced its manu-  
facturing workforce by more than  
50%.
- In 1970-76 US Western Elec-  
tric's manufacturing force  
dropped from 39,200 to 19,000. A 75%  
cutback is additionally expected  
in fault-finding, maintenance,  
repairs and installation.
- Similar trends are now  
apparent in the service indus-  
tries through micro-automation  
in supermarkets, in the garment  
trade, in offices, in design shops  
and elsewhere.
- Overall, unemployment in  
Britain is projected at the level  
of 8.5 million by 1990.
- Hines also takes note of the  
growing impact of the repro-  
grammable robot. Private-

viewers will recall my re-  
cent references to the mush-  
rooming US robot manufacturer  
Unimation (CW, May 11). The  
job application form shown has  
been filled in on behalf of a Un-  
imate robot. The corporation  
puts it out as a promotion gag.  
But the joke has disturbing  
overtones. Valerie Solanas' fan-  
tasy of replacing male persons  
by machines acquires a hint of  
feasibility — but females are  
equally vulnerable. A recent  
Times article described a word  
processor as "The four thousand  
pound typist-substitute that will  
soon pay for itself."

Where do we stand as com-  
puter people? We started it,  
didn't we?  
The situation is more acute  
because there are not one but  
two problems building up: (1)  
job-destruction, (2) the need to  
fight overseas competition both  
by modernising our own plant  
and by developing automation  
systems for sale overseas.

Yet (2) seems to aggravate (1).  
Well may Hines say "There will  
be no easy, wand-waving solu-  
tions!"

All that a computer man  
can do is see if his own profes-  
sional skill can be brought to bear  
on some sector of the problem.  
For example, contributing to  
"the human interface", so as to  
make obscure brute-force com-  
putations more comprehensible  
to the machine's supervisors, is  
clearly one of the more con-  
structive directions. Allied to  
that, the whole area of com-  
puter-aided education and  
training acquires a new, and es-  
pecially beneficial, significance.

One must sympathise with  
unions pressures for further

shortening the working week.  
None the less, I prefer the "four-  
plus one" day to the "four-day"  
week. The "one" stands for all-  
day educational release at  
employers' expense. Such a  
scheme would generate work for  
the education industry, which  
itself can absorb with benefit  
indefinite amounts of automa-  
tion to augment, not displace,

## APPLICATION FOR EMPLOYMENT

NAME Unimate 2000 B SOCIAL SECURITY No. None  
ADDRESS Shelter Rock Lane, Danbury, Connecticut 06810  
AGE 300 hours (by software extension - 15,000,000 hours)  
SEX None HEIGHT 5 ft. WEIGHT 2,800 lbs.  
LIFE EXPECTANCY 40,000 working hours (20 man-shift years)  
DEPENDANTS Human employees of Unimation Inc.  
NOTIFY IN EMERGENCY Service Manager, Unimation Inc. (203/744-1800)  
PHYSICAL LIMITATIONS Deaf, dumb, blind, no tactile sense, one armed, immobile  
SPECIAL QUALIFICATION Strong (100 lb. load), untiring 24 hours per day, learn fast, never forget except on command, no wage increase demands, accurate to 0.05" throughout spiro of influence, aqueous despite abuse  
HISTORY OF ACCIDENTS OR SERIOUS ILLNESS Suffered from Parkinson's Disease (since corrected), lost hand (since replaced), lost memory (restored by cassette), hemorrhaged (sutured and fluid replaced)  
POSITION DESIRED Die cast machine operator  
OTHER POSITIONS FOR WHICH QUALIFIED Forging press, plastic molding, spot welding, arc welding, palliating machine loading, conveyor transfer, paint spraying, investment casting, heat treatment, etc.  
SALARY REQUIRED \$4.00/hour  
RELATIVES IN THIS PLANT Five 2000A Unimates in forging department  
LANGUAGES Record-playback, assembly, Fortran  
EDUCATION On the job training to journeyman skill level for all jobs listed above  
REFERENCES General Motors, Ford, Caterpillar, Babcock Wilcox, Xerox and 85 other major manufacturers

The job application form on behalf of a Unimate robot

## FOCUS

### Managers who are out of touch

IN another article, the DP  
manager is blamed for pro-  
ducing too much information.  
Current management informa-  
tion systems are resulting in a  
disappointing lack of success,  
and blame for this unhappy state  
of information affairs is, natu-  
rally, that of the DP department.  
In this case, not even the benefit  
of any doubt is given. It is the  
information specialists from the  
DP team who is the villain. The  
basis of the threat is that DP and  
company teams speak in dif-  
ferent languages.

The answer to all this con-  
fusion is, of course, better liaison  
and communication. It is not the  
DP who is out of touch; it is  
more often the company  
management. Maybe the college  
could be encouraged to run  
specific courses for DP manage-  
ment. The curriculum could  
provide insights into simulated  
board-room sessions and group  
policy discussions. Finding out  
what life at the top is all about  
could be fun and perhaps even  
rewarding. Even better could be  
a session or two of expatriate  
company management to real-  
life computing.  
Contrary to popular company

management belief, the DP  
teams do consider themselves as  
being part and parcel of the or-  
ganisation, even if their particu-  
lar parcel comes wrapped in  
layers of technical jargon and  
techniques.  
DP management is only too  
well aware that its involvement  
has room for improvement and  
it does not take the services of a  
computer to inform the DP  
teams that their level of action is  
all too often, in a remote and  
random mode.

## Ten years ago...

COMPUTER WEEKLY  
JUNE 27, 1968  
TEDDY Thins chose a computer motif to decorate some of his  
presentations which coincided with the first ever Open Wimbledon  
Computing: power intended primarily for software development in  
data communications was installed in a new wing at English Electric's  
Kidlington factory. . . . Plans were being made by the London branch of  
the BCS to provide members with a series of evening seminars in the  
suburbs. . . . Following a recommendation by the Hotel and  
Catering Economic Development Council, groups of hotels linked  
commercially or geographically were to install computerised reser-  
vation systems. . . . A data communications network that could be the  
basis for a national system was to be established within the National  
Physical Laboratory at Teddington.

## Ten-year chess bet nearly over

The 10-year period of David  
Levy's computer chess bet ex-  
pires at the end of August. In  
August, 1968, Levy started a  
bet, now standing at £1,280,  
that no computer program  
would win a match against him  
within 10 years.

The final match which will  
determine the outcome of the  
bet will be played during  
the last few days of August. The  
exact venues have not yet been  
decided but Holland, Canada  
and the US are the most likely  
countries to host the event.

There may need to be more  
than one match and they may  
take place at different locations.  
A warm-up game is planned  
for July 25 against a program  
which will most likely run the  
Cyber 176 at CDC's plant at  
Arden Hills, Minneapolis.  
Arrangements for this have still  
to be confirmed.

## Computer fraud conference

A CONFERENCE on computer  
fraud and its prevention will be  
held at the Hilton Hotel, London  
W1 on July 4. It is subtitled  
"The Protection of Computer Use  
from Plagiarism and Abuse."

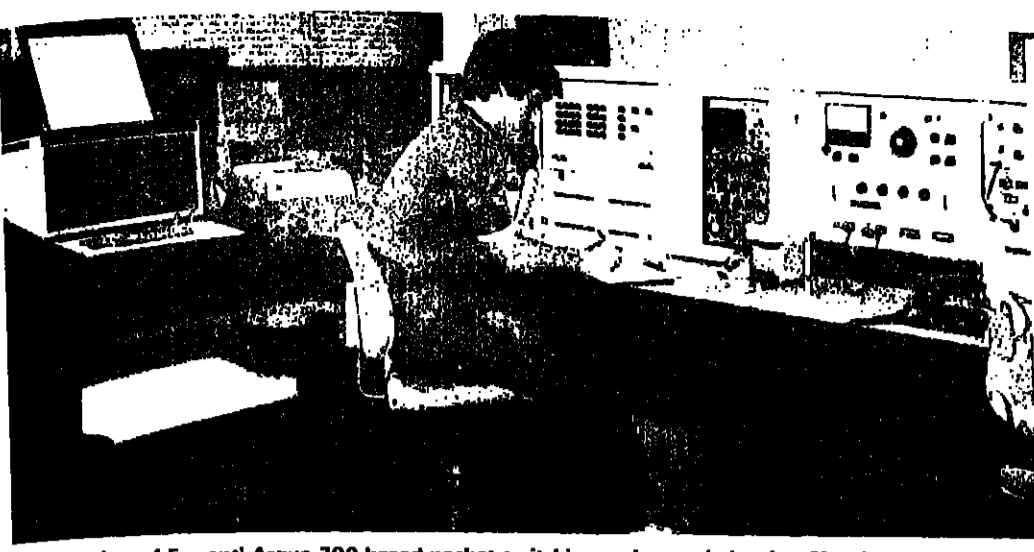
Speakers will include Colin  
Tupper, Fellow Tutor in Law at  
Magdalen College, Oxford; Bill  
Dunn, UK managing director of  
Pansophic Systems UK; and  
Michael J. Comer, corporate  
security co-ordinator of Esso.  
Further details can be  
obtained from the organisers,  
European Study Conference  
Ltd, Kirby House, 31 High Street  
East, Uppingham, Rutland,  
Leics LE15 0PY, tel. 057 282 2711.

## Gamma sets up Series 1 firm

● From front page  
already installed eight systems  
and has another 100 copies of  
COS/1 on order. Gamma gets its  
own Series 1 in September.

IBM has now announced its  
own Cobol compiler for delivery  
in the third quarter of 1979,  
which will be compatible with  
370 Cobol and costs £2,385. A  
new processor, the E model,  
with faster, high density  
memory has been added.

A disc subsystem with capa-  
cities ranging from 58 to 258  
Megabytes will be available next  
spring, as will a floppy-disc  
magazine unit which takes 23  
disks. Software enhance-  
ments include facilities to ex-  
change data with 370 main-  
frames from the 135 upwards,  
and a Structured Programming  
Facility which allows TSO users  
to offload editing from the  
mainframe to Series 1. A  
two-channel switch has also  
been added, enabling Series 1  
input-output channels to be  
switched between two pro-  
cessors.



EPSS consists of Ferranti Argus 700-based packet-switching exchanges in London, Manchester and Glasgow. Our picture shows the network service centre at London exchange.

## Scicon and NPL develop system based on micros

A MULTIPROCESSOR system,  
based on a chain of microcom-  
puters that can be extended  
almost indefinitely, is being de-  
veloped by Scicon in conjunc-  
tion with the National Physical  
Laboratory. The project is being  
supported by a £30,000 grant  
from the Advanced Computer  
Technology Projects fund and a  
further £30,000 from Scicon.

It is planned to have a pro-  
type of the system, known as  
Demos, ready next year and first  
application areas are expected  
to be in real time control,  
transaction processing and  
communications.

The basis of Demos is a high  
capacity communications link  
capable of connecting up to 230  
different micro or minicom-

puters. This is an 8 Mbyte paral-  
lel ring managed by small, iden-  
tical software kernels resident  
on each machine. These are  
written in Concurrent Pascal.  
Only the interface between each  
computer and the ring must be  
specialised for the needs of the  
particular type of device used.

Demos systems software is  
written as a single program.  
Once compiled, an independent  
system generation program  
allocates its components among  
the individual computers for  
loading. In this way a program  
can be reloaded on larger or  
smaller configurations without  
change. The systems software  
can be written to support parti-  
cular applications, and applica-  
tion programs can be written in  
a different real time language.

## Newcastle Council to stay with ICL

AFTER putting the order out to  
tender, Newcastle-upon-Tyne  
Council has decided to stay with  
ICL and ordered an ICL 2970 in  
preference to an IBM 3031 sys-  
tem. The 2970 is to be delivered  
in October.

It will replace the present  
1904S, and provide the power  
and facilities needed to imple-  
ment an integrated financial,  
land, property, personnel and  
housing management system,  
probably using ICL's IDMS  
database management system.

Running under VME/B, the  
25 Mbyte system will also sup-  
port a communications network  
that will feature 39 cash  
receiving terminals handling

having rents in 26 offices; an  
ICL 7502 terminal processor  
supporting eight display ter-  
minals for program develop-  
ment; another 7502 handling  
immigration and vaccination  
record inquiries; and various  
other terminals in schools and  
the engineer's department.

## INTERRUPT

SOME years ago a large com-  
pany installed its first computer.  
It had bid its time to ensure  
that the equipment really had  
the necessary throughput  
capacity, with efficient software  
and systems and adequate  
peripherals.

The first and biggest job was  
sales invoicing, 10,000 invoices a  
day to 250,000 delivery points. A  
considerable customer master  
file was set up, and after only 135  
program trials, the system  
seemed able to update this large  
and complex file.

All went well for a month —  
then disaster. Everything stop-  
ped for a store partly failure.  
Re-run — partly failure, again;  
change tape deck — partly fail-  
ure; read the offending record  
manually, which happened to be  
that for Elstree Rural District  
Council — partly failure. So en-  
gineers descended from far and  
wide and laboured for three days  
and nights. And the conclusion?  
A design fault triggered by the  
bit pattern of that particular  
record.

It is worth noting that the  
computer that had been so  
carefully chosen was the third of  
a new and very advanced series.

What? It's not enough to bide  
your time. If you are still a pion-  
eer.

● This week's £5 Interrupt prize  
goes to M. C. Hancock of Bath-  
minster, Wilt.

## EPSS open day shows UK well up with overseas rivals

A DRAMATIC transatlantic  
three-network link, demonstra-  
tions of a new low-cost graphics  
system, and access to the BBC  
Ceefax text display system over  
a computer network were  
among the features of the first  
EPSS Users' Open Day last week.  
The advent of X25 networks  
has tended to push EPSS, the  
Post Office's Experimental  
Packet-Switched Service, into  
the background, but the de-  
monstrations made it clear that  
in terms of network usage, UK

research institutions are right  
up with their counterparts over-  
seas.  
Steve Treadwell, of University  
College, London, demonstrated  
network interconnection by es-  
tablishing a link through EPSS  
via the big experimental US  
ARPA network to a computer in  
Los Angeles. An experiment on a  
third network, Satnet, was con-  
ducted from the Los Angeles  
computer which involved con-  
nections via the Intelsat IV  
satellite to computers in Boston,  
Oslo and London. Satnet is an  
experimental network with  
ground stations in Goochilly,  
Cornwall, in Sweden, and in  
Virginia, US, and the purpose of  
the test was to measure the  
amount of time which data  
transmitted on Satnet spends in  
each ground station.

Dale Sutcliffe of the Atlas  
Division, Rutherford  
Laboratory, demonstrated that  
packet-switched networks could  
be used for graphics work by  
using EPSS to run a demonstra-  
tion of a graphics package,  
Graphic Option Controller.  
GOC is a microprocessor-

based raster scan display  
generator which enables an or-  
dinary alphanumeric VDU to be  
used for graphics work. It was  
developed at Surrey University  
and is marketed by Sigma Elec-  
tronic Systems.

In the demonstration it was  
used in conjunction with a GEC  
4070 computer installed at  
Rutherford and linked to Lon-  
don via EPSS.

The National Physical  
Laboratory showed a number of  
demonstrations involving con-  
nection of EPSS to its own in-  
house network. Among the de-  
monstrations was network  
access to the BBC's broadcast  
Ceefax teletext system for put-  
ting up text on a TV screen. NPL  
has developed an interface  
which takes the decoded signal  
from a standard teletext receiver  
and translates it into a character  
stream.

Open day demonstrations  
were given at five centres: Glas-  
gow University, Rutherford  
Laboratory, Harwell, National  
Computing Centre, Manches-  
ter, University College London  
and Sperry Univac, London.

## DP Managers—if you're running OS or going OS you may be generating your applications the hard way.

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# DOWNTIME

by Chad

## Nationalist exiles

IN conversation the other day with Gerry Fisher, ebullient ex-president of the BCS, I discovered that he is also president of the London branch of the Scottish National Party.

I have spent several days now struggling to get my mind round the idea that there could actually be a London branch of the Scottish National Party. I keep imagining that next I will hear of a Cairo branch of the World Zionist Organisation.

I suppose it's just one of those numberless contradictions that seem, in an

endearing way, to characterise these amazing islands on which we live.

● The newly formed conference company, Information Studies Ltd has taken up residence in the grandly-titled Regal House in Chorleywood, Herts. But for the time being they are without a phone, as the Post Office is having trouble getting them lines quickly. Which is strange, as Regal House used to be the local telephone exchange.

## Noise of your choice

DOES silence get you down? Are you a founder member of Peter Simple's Friends of Noise? Then they have just what you need at Hammacher Schlemmer, the New York emporium of things for The Man Who Has Everything.

It is an electronic sound conditioner, called Environmental Sound X, and it consists of a box that just sits there and makes noises. You can select white noise, random surf effects, the sound of single waves breaking, light rain, a steady downpour, or a waterfall. You can even, if you wish, switch it off.

All this is meant to aid relaxation, or concentration at work, and only costs \$129.95. Do not scoff at Yankee ingenuity—it makes money. In some American joke boxes you can put in a quarter and choose a record that gives you two and a half minutes of silence.



## Poets' Corner

ONE of the fringe benefits of being director of the National Computing Centre, as is David Firnberg, is that you get to present bouquets to award-winning operators. Firnberg is seen above with the finalists in Wordplex's Operator of the Year competition for word processing typists.

Mrs Lesley Draper won the award for her dactylographic expertise, and for writing the following poem:  
I glide through the words now with the greatest of ease,  
As they form on the screen at a touch of the keys,  
I can change them, arrange them, save or delete,  
Form letters from phrases... Wordplexing's so neat!

I am sure you will agree that Pam Ayres must look to her laurels.

By the way, there is no truth in the rumour that David Firnberg is to judge the Miss World contest next year.

## NEWBURY

The home of Low Cost Visual Display Terminals

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Model 7004 (64 Char. Set)  
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British Design and Manufacture  
Low Cost  
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Switchable baud rate from 75 to 9,600  
Dual Interface—CCITT V24 and 20/60 mA current loop  
Hard Copy Print out  
Switchable half/full Duplex  
Video output for External Monitors  
Green phosphor screen

Model 7000



British Design and Manufacture  
Low Cost  
Teletype Compatible  
24 lines of 80 characters per line  
Switchable baud rate from 75 to 9,600  
CCITT V24 interface  
Switchable half/full Duplex  
Green phosphor screen

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# 'Adapt to computers or face disaster'—MP warns

UNLESS political and economic institutions equip themselves to use the techniques and capabilities offered by computer technology, society could be faced with disaster.

This was the main thesis of a talk by Conservative MP Ian Lloyd, when speaking at the "Computers and Peripherals—1980 and Beyond" conference at the US Embassy, London last week.

Lloyd, who is chairman of the House of Commons Science Sub-Committee, opened the computer seminar with a talk entitled "The Political Control of the Silicon Revolution," but was himself dubious that any such control should be exerted.

In fact he suggested that as there was a great danger of the wrong political decisions being made due to a lack of awareness of the

situation, it would be better for the government to sit tight and do nothing.

"The government must not promote false confidence," said Lloyd. "They must not get in the way and start stating which industry may do one thing and which industry may not. If this does occur, people will not tolerate it; they will react irrationally or even possibly violently. It is profoundly important that they learn more about technology. The Japanese have realised this, as have the Americans, who have always had a passion and flair for technology."

But one of the difficulties in achieving such an admirable state of affairs was that there were two schools of thought, both giving contradictory advice, he added.

"There are those who think the techno-

logists are crying wolf," he said. "They look at past events and point out that society has taken them in its stride despite famine, world war, and other slumps."

"Then there is the apocalyptic view where people say that we are approaching an 'event horizon'—a discernible black hole in technological space. They believe that we have little time to come to terms with the problems. . . . I am inclined to this latter view."

Other speakers at the seminar included John McNulty, managing director of Modular Technology, who described the advances we may see in computer peripherals during the 1980s; and Gordon Scarrott, manager of ICL's research and advanced development centre, who outlined the "Effects of Merging Logic and Memory in the 80s."



LLOYD... "better for the government to sit tight and do nothing."

## NEWS IN BRIEF

### Philips to build 2,300 minis at Rambouillet

THIS year Philips plans to build 2,300 P800 series minicomputers at its Rambouillet plant, near Paris. Half of the output will be fully configured minis for use in process control and other applications; the remainder will be shipped to Sweden for incorporation into PTS 6000 banking terminal systems.

Four in five of the minis made at Rambouillet go for export, while imports of components for their manufacture amount to only 30% of their value.

### PO policy change

WHEN a Post Office policy change takes effect in July, it will no longer be necessary to rent an additional exchange line for each leased line modem. The Post Office considers its modems are reliable enough to do without a remote test facility for PO engineers.

### Prime time

TO provide a time sharing bureau service for structural and civil engineers, a Prime 500 system has been installed by Fiber Computer Operations of St Albans, Herts.

### Division may close

THE plan for Cincinnati Milacron to sell its commercial systems division to CSD International, a company set up by Milacron employees (CW, May 18) has foundered because agreement could not be reached on price. Cincinnati Milacron's business systems division, set up to win a wider market for the minicomputers, which the Ohio-based company builds to control its machine-tools, is now likely to be closed down.

### Belgian order

ORDERED 18 months ago, two NCR Criterion 8570 mainframes have been installed at the Belgian Finance Ministry, where they will replace two NCR Century 200s at a lower cost. Applications include income, property, company and motor taxation and are being developed in Cobol 74. The order was in competition with NCR, CII-HB, Univac and IBM.

### MS profits

FINANCIAL results published by MSD for its financial year ended April 30, 1978, include revenue of \$153 million and net profits of \$7,259,000, compared with figures of \$146 million and \$1,837,000 in the previous year.

### Primer approval

THE interprocessor-based language, the PACS 200 from TMC, has received Post Office approval for linking to the public telephone network. The language comes in several versions.

## Fujitsu gives details of 'most powerful system'

SOME details of the world's most powerful general purpose computer, the Fujitsu M-200 have been clarified by the company.

Fujitsu now says that the M-200 CPU is an enhanced version of the M-190, which is effectively an Amdahl 470V/6 with 10 extra instructions, and that multi-processor versions of the M-200 are configured with each processor having its own memory, rather than all memory being common. The M-200 is available with up to four processors and a theoretical maximum main memory capacity of 64 Megabytes. However, Fujitsu says that the capacity of the registers limits this to a practical maximum of 32 Megabytes.

In maximum configuration, the M-200, which will be available in Europe from Siemens, is claimed to offer five times the power of an IBM 3633 uniprocessor.

Fujitsu also says that its new large-scale OSIV-F4 operating system is "object and source code compatible with programs written to run under IBM's MVS, implying that such programs can be transferred to a machine running under OSIV-F4 without recompilation."

The fact that IBM operating systems are made available by the company without restriction

on the hardware on which they are run, raises the question of why Fujitsu should bother to develop its own version of MVS. The reason is that it is apparently illegal in Japan for a user to run an IBM operating system on a non-IBM machine.

Fujitsu's partner in the M-series, Hitachi, has not yet announced its own forthcoming supercomputer, which is claimed to be even more powerful than the M-200, and will be added to ICL's AS series as the AS/7. However, it appears that the Japanese trade and industry ministry MITI has vetoed the unofficial name of M-210 that Hitachi wanted for the machine.

Unaudited figures from Fujitsu for the year to March 1978 indicate that turnover has risen sharply and now stands at almost exactly £1,000 million at the current rate of exchange for the Yen. The turnover of 387,400 million Yen shows an 18.3% advance over last year's 327,959 million Yen. Fujitsu recorded a pre-tax profit of 13,500 million Yen, down from 18,000 million Yen last year, and representing a mere 3.5% of turnover. For the current year, Fujitsu is projecting further strong advance in sales, looking for 447,000 million Yen, on which it hopes to make 14,000 million Yen in pre-tax profit.

## UK group to study online query languages

A NEW group has been formed in the UK to study online query languages.

The chairman, Roger Tagg, of Scienn, says that there are already about 100 such languages available on various computers, and with no standard syntax or style in existence, there is an urgent need for a framework for future developments.

One aim of the group's work will be to specify a range of standard function types which any language should contain. This would then act as checklist for those designing or evaluating query facilities.

A standard syntax, Tagg pointed out, would fall outside the scope of this work. Users themselves should choose the precise form of dialogues, which

can in general be constructed later, for example by using macro facilities.

The group which has already met twice, is likely to affiliate to the BCS Information Retrieval specialist group. The latter is predominantly concerned with bibliographical systems, in contrast with the new group which will consider information retrieval more generally, including database and data analysis systems.

The group has set itself the objective of publishing a report during 1979. This will cover relevant aspects of the user-computer interface and will also categorise the languages currently available, distinguishing for example those which are syntax driven from those using prompt/response techniques.

## 'Prime targets in a strike'

GOVERNMENT computer centres, particularly those involved in revenue collecting, would be prime targets in strike situations. This view was put forward by a spokesman for the Civil and Public Services Association, who refused a comment on the Civil Service Department review of computers in central government that had been attributed to

the association (CW, June 8). He said the CPSSA agreed in the main with the view put forward in the report. "The use of selective strike action has been, and will continue to be, one of the major effective means of applying pressure to the employer after negotiations have broken down," he said.

## NCR's latest sorter can handle up to 750,000 items a day

A LOW-COST electronic teller terminal and a computer system for reading and sorting cheques and other documents are the two latest additions to NCR's financial range.

The NCR 2261 is a micro-based teller terminal that can operate as a stand-alone system or be upgraded for online communications and data capture applications.

It can be programmed via its keyboard or, if the terminal is operating in an online mode, programs can be loaded from a central computer or cassette unit. In addition to standard teller-transaction functions, the 2261 offers the ability to calculate interest, and it can perform positive proof of deposit at the teller station and automatically produce withdrawal cheques.

The inserted forms station used for passbooks and printing on various inverted documents includes a 60-column matrix printer.

The NCR 6780 cheque and document sorter is a modular system that can be tailored to handle between 50,000 and 750,000 items per day.

It begins with a 24-pocket system that can process 1,200 items a minute, but this can be expanded with optional features.

A sorter-controller will be released by NCR early next year and this will reduce the system's dependence on the host system as well as providing multiplexing capabilities.

A total NCR/OCR, reading facilities with logic to reduce misreads and item rejects by doing a digit-by-digit comparison, will also be released in 1979.

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# GILB'S MYTHODOLOGY

## How to specify all your project goals in measurable form

THERE is the tale of the intoxicated party-goer searching on a well-lit street. A passer-by starts to help him to find the wench he has lost. After half an hour, the passer-by asks: "Where exactly did you lose the wench?" "In that dark alley to the left," says the party-goer. Exasperated, the passer-by demands: "Well, what are we wasting our time looking for? Under this street lamp for?" Our tipsy friend replies, with frightening logic: "Because it's lighter here!"

We computer specialists seem, consistently, to apply the intoxicated logic of the party-goer to our projects. We set, as clear measurable goals, only those things which are simple and obvious to measure, like finished date, costs, speed and space.

Things that are more important to the success of the project, like reliability, maintainability, portability, ease of user learning and recoverability of files, for example, will typically be unspecified. Or at least the specifications will be so unclearly specified as to be worthless.

For example, a bank real time project, where the hardware supplier was committed to writing 200 terminal sub-routines, had this maintainability specification: "Our maintenance programmers shall be able to maintain the programs." I would ask: If they find a bug that's stopping the online system within two weeks, is the system meeting the maintainability specification?

Jerry Weinberg created the

Zeroeth law of reliability, which goes something like this: If you don't care about the reliability goal of a project, you can meet any other goal of the project. Which is another way of saying that if you don't care to measure whether the system works properly, you can deliver it yesterday. If, however, you want it to work perfectly, your user may have to wait forever.

In the real world, you and your user are going to have to reach a compromise. And that will require clear, quantitative and practically measurable definitions of the reliability concept.

I tend to think of a computer project as a boat with some random holes in it. Some holes are below the waterline. If we don't plug

them all, we risk sinking. If we only manage to plug most of them, we are going to have to do a lot of work getting rid of the water in the boat. If we plug holes above the waterline ("non-critical goals"), instead of the ones below, we may sink while we are plugging the wrong "goals".

In my experience we are all guilty of plugging holes above the waterline, and stuffing pieces of bread into some of the critical holes. As an example of the latter, I'll bet that few readers ever define a measurable goal (not a technique which you hope will get you some result) for maintainability of programs. I'll bet that you have been stuffing breadcrumbs into that hole (structured programming, modularity, comments, indentation,



documentation). At all computer installations I have visited I have never been shown details of any past or present project, where all critical goals are stated in quantified and measurable form.

I find this state of affairs incredible. Data processing is management without objectives. In some areas of system quality we are in such a poor state that we don't even know a realistic level of an objective because we have never even measured the levels at previous projects.

Enough of this criticism. I have been as guilty as anyone. But I have tried to mend my ways. And I find great interest and ability among my clients and course participants for the exercise of setting formal quantified goals for projects. It takes one to six hours of work to pin down eight to 16 goal areas.

You might even do it for projects already under way, but you should start now to practise it for new projects. How else can the manager manage the project?

We fill out a "metrics matrix" as one colleague dubbed it. Along the vertical axis we list the dozen or so most critical high level goals. If you have more, you are probably listing too detailed goals: this we do later by "exploding" high level goals ("security") into more detailed goals (file security, fire security, embossment security, etc).

Then along the horizontal axis we fill out parameters describing our critical goals: measure to be used, planned quantitative level, worst acceptable case level, best imaginable case level, priority, "more important than other goal," and finally a reference to the authority documentation for claiming this goal and its levels to be high priority.

As Lord Kelvin once said, if you can't quantify your knowledge, then it is of a meagre and unsatisfactory kind. We find we can satisfactorily quantify all critical goal areas, and then use them to design the system. Try it now!

## PROGRAMMER NOTES

### Advantages of a file handling library

FILE handling is such a basic component of programming that most people tend to use manufacturers' routines. But a home-made file handling and record handling library can offer a number of advantages, particularly where the standard facilities are limited or awkward to use.

Consequently Programmer Notes presents some ideas on a do-it-yourself I/O library.

The routines should be written in assembler and stored in a separate system library to be linked in with applications programs at LOAD time.

The routines likely to be used most often are those dealing with opening and closing files. Suggested formats are OPEN (unit number, file-name/password/owner-account-name, location, access method, new or old, READ/WRITE privileges, expiry date, status); the CLOSE routine parameters will be a subset of those with an additional retain or destroy parameter.

The file name may be supplied by JCL, by the user or operator in response to a program request, taken from a file, or even generated by the program.

However supplied, the name will be in text format and needs checking for illegal characters. Remember too that the user's terminal or card deck may be a valid file "name" default and should be allowed.

Passwords need similar validation and any account numbers should be checked. This helps to see whether a user is trying to create a file in an account other than the one he's using.

Although location of the file will default to primary disc storage, users should be allowed to request a tape or other secondary storage. The identifiers should be checked for basic validity, and any operator messages produced.

The access method parameter should allow for the file to be created as — keyed, random or sequential. When a file is to be read it may be possible to treat a keyed file as sequential. This means that when the OPEN or CLOSE request has been satisfied by the system, the file's access method type should be checked back with the initial user request.

### System performance aid in Shadow II update

FORTHCOMING enhancements to Altergo's Shadow II TP monitor include two major new facilities developed by the company in the US. Energetic marketing in North America, including the opening of eight regional offices earlier this year, has already given the product around 70 US users.

One of the new facilities is a tool for predicting online system performance. Based on a model of the proposed system, the

software will yield statistics on such parameters as resource utilisation and response time.

The other facility, Online Mapping, already has some 20 users in the US. Based on a special map file, which stores map definitions, the subsystem is claimed to result in an average 30 per cent saving in overall programming and testing time for TP applications.

Fully interactive, Online Mapping eliminates the need to compile map definition programs, and checks for incorrect specifications, flagging the errors.

The system enables an existing map to be recalled to the screen, from where it can be easily modified or used as the basis for creating a new map. A chargeable option, Online Mapping costs £2,400.

#### Puzzler

TRY this one in your head. A climber walks up a mountain slope at 31 ft/min, and down again at 44 ft/min, taking six hours in all for the double journey. How many miles does he walk?

See page 40 for solution.

## SOFTWARE FILE

### Basic Timesharing reveals details of access protection feature

TWO system software packages and an online accounting system for Basic Timesharing's RTI-4000 machines are being marketed in the UK by Cara Consulting. At the same time, Basic Timesharing has revealed a unique proprietary account feature which protects installed vendor's software from unauthorised access.

Cara's Midas system, developed in the US by DLM Enterprises, is an integrated accounting and inventory control package. Based on a network of direct access chained files, the system is not

able for updating all linked files automatically when a transaction is entered.

The system handles a comprehensive range of functions including general ledger, order entry, bill of materials, job costing, and invoicing. Little batch processing is performed, except for example such functions as producing statements.

Offered in the US largely through bureaux, the system has about 70 US users.

Cara's other two offerings, also developed in the US, to some extent overlap in their capabilities and are sold there in competition.

Minds, a database manager and report generator, incorporates a high level command language and searching and sorting facilities. Like IBM's Brads (Software File, June 15) the system includes a data dictionary controlling application program access to files.

The other application development tool, Mars (Multiple Access Retrieval System) provides file handling facilities based on an indexed sequential access

method. It is designed for use by end-users as well as application programmers, providing means of defining and creating files and also updating and retrieving stored data. Both packages provide for multiple concurrent access to files.

Said to be unique, the proprietary account feature on the RTI 4000 allows software suppliers to licence the use of software without allowing access to the source code.

The protection is provided by the account structure of the operating system. Programs held in a secure account cannot be accessed without supplying a high-level password, which is held in the operating system software.

The technique is feasible because Basic Timesharing permits only very restricted access to its system software, forbidding examination of the operating system either in core or on disc.

An interesting aspect of the facility is that it still permits the software vendor dial-up access to the system, so that he can maintain and update the package from his own office.

## Portability key to NAG for minis

FOLLOWING its implementation last year for the Prime 300 (Software File, August 18, 1977) the Numerical Algorithms Group Fortran library has now been made available on several further minicomputers.

Perhaps of most interest will be versions for two Digital Equipment machines: the PDP-11 range and the new VAX-11-780. Also offered are implementations on Harris equipment and the Rank Xerox 530.

Yet to be completed but currently under validation, are versions for GEC 4070 and 4080 hardware, the ModComp IV, Nord 10 and 50 systems, and Univac V77.

NAG is also working on an implementation for the Cray 1 super computer.

Dr Brian Ford, the director of the Group, pointed out that the remarkable portability of the software was in part due to the use of a carefully selected subset of ANSI Fortran.

Also significant was the isolation, in the source code, of explicit parameters defining essential numerical features of the machine.

These strategies had enabled NAG to avoid the major rewriting of software found necessary in other numerical libraries, he noted.

The team had been particularly

impressed, he said, with the ease of the VAX-11/780 implementation. Conversion and validation of the library generally took around three man-months, but transfer to the VAX had been completed in only one man-month.

Despite the concurrence of new hardware, a new operating system, and a new Fortran compiler, all 345 library routines had been implemented on VAX virtually without any difficulty.

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Despite the concurrence of new hardware, a new operating system, and a new Fortran compiler, all 345 library routines had been implemented on VAX virtually without any difficulty.

### Time sharing system that Offers 'TSO for OS/VS1'

A TIME sharing system described as an implementation of TSO for OS/VS1 has been adapted for marketing by The European Software Company (Software File, June 8). The system, Tone-3, was developed by Tone Software Corp of Anaheim, California, and runs on IBM 370-135 and up, and IBM 370-135 and up, and IBM 370-135 and up.

Tone-3 is in general functionally equivalent to TSO, offering similar facilities for interactive program development as well as supporting systems programming and operations activities. Its terminal command language and command processors are TSO compatible.

An interesting architectural feature of the software is the elimination of user swapping. In TSO, (which is available only under OS, MVS, SVS, and MVS) imposes swapping on paging, resulting in a somewhat greater overhead.

Another factor claimed to improve throughput is the use of FIAM rather than TCAM.

The storage requirements of the system developed in the US to meet the needs of a company in the areas of structural analysis and project management. Widely used in the US, it includes the well-known Stress program for the analysis of large and complex structures.

Revision 3 of Ansys, the popular finite element analysis system, enhances areas including element handling, analysis capabilities, input, output and graphics processing.

Systems Professional, also known as Sys Pro, is a library of software developed in the US to meet the needs of a company in the areas of structural analysis and project management. Widely used in the US, it includes the well-known Stress program for the analysis of large and complex structures.

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### Real time monitor for MVS

A real time monitor for IBM's VSI and MVS operating systems is the latest Value Computing product to be released in the UK by RTZ Computer Services.

SMT (Systems Management Tool) provides real-time displays of resource utilisation, permitting systems programmers and those responsible for production to fine-tune the system. A unique early-warning mechanism is also provided, that notifies the user of pending job time-outs and allows the time to be reset. SMT is priced at £2,800.

### Telecomputing confirms VME interest with order

WITH an order for an ICL 2950 system, Telecomputing has confirmed its commitment to develop TP software for VME/K and VME/B users. The new system will be used initially for the development of TPS Care under VME/K (CW, October 6, 1977).

The primary aim of TPS Care is to ensure that existing TPS users enjoy complete software portability from 1900, 2803, and 2904 systems to the 2900 environment.

In support of this goal, the company has set three specific objectives: to present an unchanged user terminal interface; to provide the same user programming interface; and to provide additional code in any areas where the standard operating system falls short of current TPS facilities.

TPS Care will inevitably be a higher level product than current TPS versions, as many of the existing functions should be

handled by the operating system, said the company.

One of the first tasks on the new machine will be to validate the basic transaction processing facilities in VME/K, scheduled to appear in version KSV-18 of the operating system next March.

This release should coincide with the delivery of the 2950 to Telecomputing's Oxford headquarters, also planned for March, 1979.

First deliveries of TPS Care for VME/K are expected around autumn 1979 and will be followed by a version for use with VME/B. A common TP interface between the two operating systems, notes the company.

In addition to catering for the development of TPS Care, which will be written in SFL, the new machine will be used to provide a VME/K bureau service.

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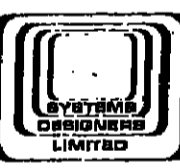
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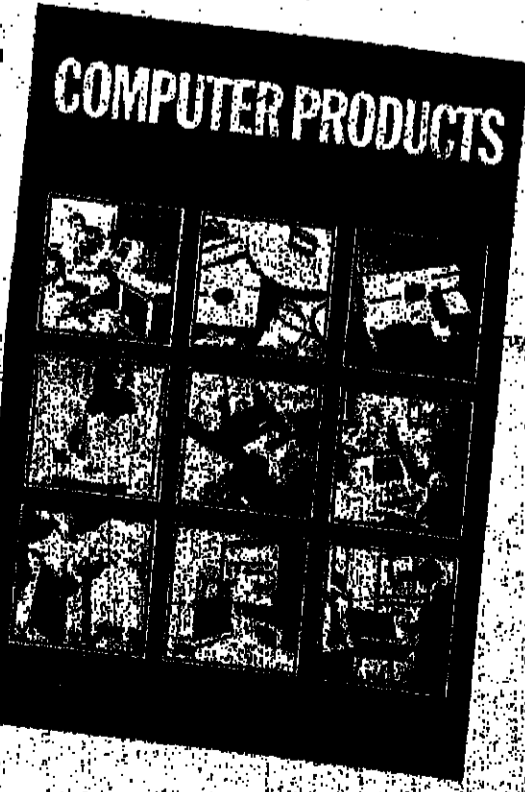
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## Bids in for Midland users consider setting up standby installation

### 9600bps Datel modems

BIDS are now being evaluated by the Post Office for the manufacture of modems for use on the 9600 bps Datel service which is planned to introduce in 1979.

Contracts for the modems are expected to be placed in about September this year.

Meanwhile a stop-gap 4,800 bps service is operating in the City of London, where 50% of the data transmission handled by the Post Office is centred. Called Datel 4832 it is based on the Racal-Milgo MPS 48 modem and will operate until early next year when the full 4800 bps service based on the Post Office's Modem 11 is scheduled to begin.

This will be enhanced in mid-1979 by a further model of Modem 11 which will support multi-drop lines.

The Post Office's X25 data network is expected to be in service in 1979 or 1980, although it has not yet had formal approval.

THE establishment of a computer centre specifically for providing IBM standby facilities is being considered by the Midland Users Group, Mug, an association of big IBM users in the Birmingham area.

The centre would be funded jointly by Mug members which include BL Cars, Dunlop, Pirelli, Tube Investments, Lucas and GEC.

John Leighfield, systems director of BL Cars, told Computer Weekly that the standby centre is currently being discussed by himself and his counterparts from the other Mug member companies. He said that the centre would probably be similar to one set up in France by Renault and several other major IBM users in the Paris area. When not running work for Mug members whose systems had gone down it could be used for program development.

Mug sees itself as a high level pressure group and is taken seriously by IBM, whose UK boss, Eddie Nixon, has already addressed one of the group's meetings. Gene Amdahl, the boss of IBM's arch

rival, has also spoken at a Mug meeting. BL Cars, which is now concentrating most of its mainframe processing power at its Redditch cars data centre, already has mutual agreements with Lucas and Pirelli to provide standby facilities. Last Christmas BL Cars made use of IBM's bureau centre at Warwick, after one of its 370/158s at Loughbridge went down.

## Leyland threat to IBM at Warwick

THE teleprocessing bureau operation set up by IBM at Warwick may soon be facing competition from the centre opened by BL (formerly Leyland) Cars at nearby Redditch (CW, June 22). Chris Chiles, group DP manager of BL Cars, told Computer Weekly that the data processing capacity of the Redditch centre would be expanded by about 30 per cent a year over the next few years and that the intention was to sell bureau services to completely separate outside organisations.

This would be in addition to the processing already being carried out for more than 30 BL Cars sites all over the UK.

Although BL Cars does not actively market bureau services at the moment it already carries out some processing for non-related companies on a limited scale and also provides a number of services for about 300 distributors of BL Cars.

These services already include supplying distributors with bin price lists and early next year BL Cars will introduce a batch stock control service. Distributors using this will be equipped with IBM 3741 key-to-diskette data collection stations.

Future developments could include offering services to distributors of the other manufacturers' cars and this would put the Redditch centre in direct competition with bureaux already in this business.

By the end of this year the Redditch centre will have two 370/145s, two 370/158s and a 3033, but Chiles said that the 158s would be replaced next year by a 3033 or by an Amdahl machine. This could be an Amdahl 470 V/7, the biggest machine that Amdahl builds and the most powerful general purpose computer currently available.

### Study of word processing in US

A JOINT team from the Civil Service and the Office Machinery Sector Working Party of Noddy is to make a fact-finding trip to the US this month.

A range of installations will be studied in the US government and in private companies, both successes and failures, to glean information to aid the development of the UK word processing business.

Three representatives from the Sector Working Party will be on the team, with one each from the management services division of the Civil Service Department, the Central Computer Agency, and the Stationery Office.

The team feels there is a lot for it to learn in the US, where the word processing market is more developed than in the UK.

### NEWS IN BRIEF

#### DEC's family of terminals

INTELLIGENT data capture is the main application area for the PDT-11 family of programmable display terminals introduced by Digital Equipment. The three members of the family, the PDT-11/110, 11/130 and 11/150 all incorporate DEC's LSI-11 microcomputer, which is compatible with DEC's PDP-11 minicomputers.

All three terminals are built around a new video terminal, the VT100, which can display 132-column lines. In addition, the 11/130 has two cartridge tape drives while the 11/150 has floppy disc storage. There is also provision for a local printer.

#### Online system

TWO Prime 300 computers have been ordered by the Building Research Establishment, a government research body which carries out research into the construction industry. The first will be used by the Establishment's Library and the Building Research Advisory Service for online information retrieval of the Establishment's records, and the other will be used for computer graphics.

#### CAM seminar

ANOTHER two-day seminar on the problems of interconnecting logic devices is to be held by CAM Consultants on July 10 and 11. Subjects to be covered at the 11. Subjects to be covered include cross talk, power supply decoupling and signal termination and drive techniques. Further information on the seminar can be obtained from CAM at 17 King Harry Lane, St Albans, Herts AL3 4AS.

### OP SPOT

## 'Most managers don't have a clue'

OPERATORS' skills are made use of, but the fact is rarely recognised — with the result that the staff do not get their just reward in terms of pay and promotion.

The great problem is that senior management seems to be incapable of differentiating between operators who are competent technically, and those who are not.

This is the opinion of a senior operator who contacted me in response to an Op Spot of a few weeks ago, which reported on the DPMA meeting concerning the relationship between operators staff and DP management.

He told me "I started in operations with a company which provided me with an excellent grounding in computing. They sent me on a series of courses and also arranged for a lot of 'hands-on' training to be carried out at the site."

He stayed with the company for about two years, but left because he worked "an odd shift system" and he wanted something less tiring.

He continued, "I went along to an agency and they told me of a company which was in the process of converting from ICL. It was to that which I was trained, IBM. Subsequently I went along for an interview and got the position of senior operator."

Apparently none of the operations staff had relevant

knowledge of either the hardware or software, and he soon became involved in training them informally as well as carrying out the function for which he was paid — operating.

"I did much to help the staff get acquainted with the system, and that included those who were on a higher grade than I."

After he had been at the site for about a year, one of the operations staff left the company and the position of shift leader became vacant. He applied for the job, but was given little consideration.

"So much for all that training of staff," he said ruefully, adding "I had an interview for the job, with the operations manager and the DP manager, and it was obvious I had no chance."

He blames the DP manager and the operations manager for failing to appreciate his technical competence, and for taking his hard-won skills for granted.

Of the DP manager, he said: "As far as I can make out, the DP manager is a nice person, but it is obvious that he has no idea of the hardware, software, or the manner in which the computer room is organised."

Talking of the operations manager, he said: "At first I thought he was someone to be trusted but at the last staff appraisal he told me that I was doing really well and would be upgraded in the salary scale in the near future. However, by

## Don't try to guess what the programmer meant

"If in doubt, throw it out — that is an old operator's motto and it is still largely true, particularly for testing work. If you don't try to enforce installation standards they will quickly be ignored altogether."

That is the view of Bob Stevenson, who has some 19 years' operations experience, and writes in response to an Op Spot on operations documentation (CW, May 14).

He continues: "Surely all experienced operators know that to try to guess what a programmer really meant is a sure way to waste hours of machine time and overwrite files."

Says Stevenson, "Unfortunately your example is not a good one as it concerns testing work. Documentation for testing is never a great problem because it is not needed in any great depth. All that is required is a well-designed run sheet and some installation rules about testing."

The real documentation problem is with live work, which will still be running after the analyst and programmer have gone to join a contract agency. This is when the extra informs

tion on restarts, system flowcharts and sample print layouts, etc is required.

"The main problem is actually getting the documentation before the 'go-live' date. A method that works fairly well is to draw up a detailed dummy set of operating instructions and circulate copies as a standard."

Stevenson makes some interesting comments, but his criticism of the example I gave is unfounded.

On the occasion described, a programmer used the job stream dedicated to testing work to submit a library compression job to the system. The job soon exceeded the time allocated to testing work at that site with the result that the operator, in accordance with the installation standards, cancelled it.

The point I was trying to make was that if the job had been accompanied by documentation which included data as to its function, the operator could have let it run to its conclusion. He could then have contacted the programmer concerned and warned him not to do it again.

## Tape Library Controller £125,000

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### By Bernard Allen

#### HINT OF THE WEEK

## Beware when resetting job priority

THIS week's hint relates to the resetting of jobs in the IBM OS/VS environment.

In order to make the best practical use of the system resources, and so aid throughput, the console operator should be constantly aware of the facility which is available to reset job PRIORITY.

However, when rescheduling work in this manner, the operator should ensure that he resets jobs to priorities which are higher than the system default. This is achieved by use of the following OS RESET command:

E Jobname,PRTY = new priority

The reason for this is that if a job's priority is set beneath the system default, all subsequent work will immediately be processed before it, leaving the job concerned on the input queue for an excessive length of time.

The resetting of work via the console is scorned at some installations where it is argued that the work has already been scheduled in order to get the best 'mix'. But the practice is often necessary.

## Barclays relocation unpopular

THE intentions of Barclays Bank for two of its London computer centres do not seem to coincide with the career plans of a considerable number of its operations staff.

By the middle of next year, the bank's sites at Harrow Road, Harlesden, and in the Tottenham Court Road will have been relocated to a new centre in Gloucester.

According to members of Barclays staff, there has been a

steady flow of leavers since the proposed move was announced last October. The figure is said to be about three a month.

The bank has offered a

number of benefits to staff who are prepared to make the move to Gloucester. These include a 2½ mortgage for persons of 21 years and over.

Operators often complain that nobody listens to their point of view. Well, Op Spot is listening and Bernard Allen would like to hear your opinions and ideas on all matters relating to computer operations.

Your letters should be sent to Op Spot, Computer Weekly, Dorset House, Stamford Street, London SE1 9LU. Telephone calls are equally welcome and Bernard can be contacted directly on 01-251 8035.

## Nabisco wanted distributed processing not distributed problems - so they ordered the Nixdorf 8820

When you are one of the world's largest food manufacturers and you are planning to expand your vitally important order processing and stock control system, you cannot afford problems.

Take Nabisco — famous for Shredded Wheat. They wanted to further sophisticate their computing facilities by establishing an integrated communications network, with auto-dial at the master station and automatic answer at the remote sites. Their depot staff were not computer-trained

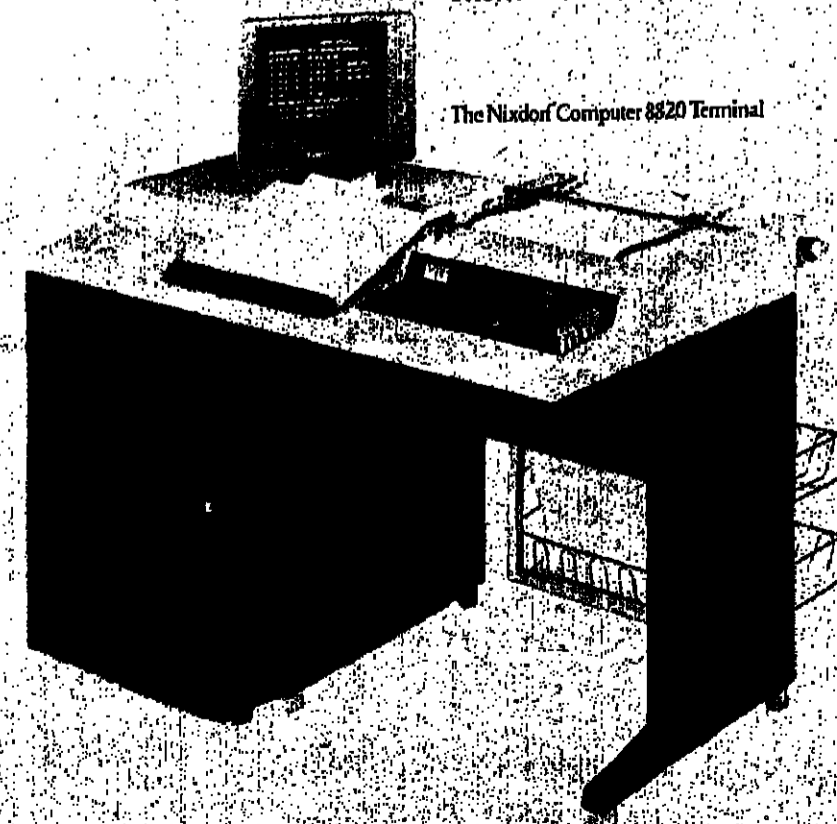
personnel. They knew the sort of problems that arise in such distributed networks.

Problems like: "We had a power failure and all our data was lost." — "Someone has removed a diskette with files left open." — "We have very little office space available." — "We do not want to learn another, non-standard language." — "Can we overlap input/output operations?" — "We may need up to 60K of memory." — "Our people have never used a computer before."

A company like Nabisco does not venture into a project like this with eyes shut. They looked at a number of terminal systems and only one manufacturer had a machine that could provide a satisfactory solution to all those problems and more besides.

Nixdorf is the manufacturer and the machine is the Nixdorf 8820 intelligent terminal.

So Nabisco purchased 10 Nixdorf 8820s and the entire system went live at all depots on April 1st. They are now looking to develop the system still further.



The Nixdorf Computer 8820 Terminal



For further details of the Nixdorf 8820 and the Nabisco network, telephone Roger Cordery on 01-572 3111.

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# HAVE YOU CONSIDERED THIS ISSUE?

Input technology: How much of your data processing budget is taken up by the input process? — Too much? An internationally known consultant and author of countless computer books and papers has written an exclusive major article for DATA PROCESSING, entitled: 'The new generation of input technology'. In which he demonstrates how data processing itself can eliminate encoding forms and repetitive verification.

Computer output microfilm: Your organisation could, probably, save over 95 per cent of the office space devoted to filing — simply by using microfilm. You would also ease document retrieval and slash copying costs. Coinciding with Microfilm Europe, we review the latest products.

Do-it-yourself: Availability, versatility and cheapness of the microprocessor are instrumental in a continuing 50-per-cent-plus annual growth rate in the office, and home, do-it-yourself computer field. An expert provides pointers to getting started, and we ask what lies ahead in the market.

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Three studies in concentration among Computastars competitors.

# A high standard from London N of Thames

ONCE again, spectators basked in the bright sunshine as the competitors toiled in the heat, at the London, North of Thames heat of Computastars held at the Willesden Stadium last week. A record entry this one, with some 31 men's and 12 ladies' teams taking part in a whole range of events in the hope of qualifying for the final.

The day was concluded with a series of gruelling steeplechase races, and at the end of it all Patrick Kamara, an operator with the Midland Bank, and Gayle May of Case, emerged as the Computastars of the area. Patrick is a natural athlete, as found out when I finally

managed to track him down in the bar after the day's exertions. Apparently not very tired, he told me: "The steeplechase was the hardest, coming at the end of the day, but I didn't find the other events too tiring. I don't do much sport, although I play football occasionally."

Unfortunately I was unable to find Gayle when the competition finished, but having seen her romp home in the sprints, I feel sure that she didn't even stop at the end of the steeplechase and ran all the way home!

The men's team competition was won by the team from Gordon and Gatch with 141 points, with London Transport on 132½ points in second place. The team from EMJ won the men's plate.

In the ladies' competition, Allied Suppliers were top with 80½ points and the team from Case finished in the runners-up spot with 76½ points.

Some of the athletes who took part in the heat appeared to be of a high standard. A fact confirmed by Gordon Cairns, of John Goldsmith Computer Services, who said, "Some of the teams have been training quite hard for the heats, and the attitude seems to be getting more serious as the competition goes on."

Obviously satisfied with the way the day went, Cairns added, "We have learnt a lot since the first couple of meetings, and today we kept things moving so that the competitors didn't have to wait about too long between events."

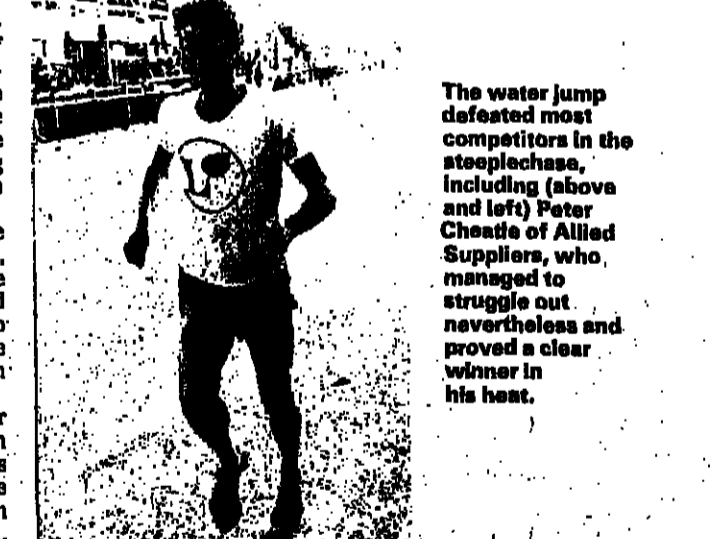
In the press-ups event, for example, each person goes on until he reaches his limit as opposed to a set time, and in the penalty kicks, we now use both goals."



Steeplechase competitors in action.



The water jump defeated most competitors in the steeplechase.



Smiles of victory for Jayne Whelanhouse (above), a tape librarian at BOC Detective, after her win in the ladies' jump-ups. (Below), Computastars of Tomorrow — enthusiastic participation in one of the children's races.



## Final heat

COMPUTASTARS is organised by John Goldsmith Computer Services and supported by Computer Weekly.

The last regional heat will be for teams from the Midlands and will be staged at the Alexandra Sports Stadium, Perry Park, Birmingham on Sunday, July 9, beginning at noon.

The final of the competition takes place at the Crystal Palace Sports Stadium on September 30.

## PEOPLE

### Girl Technician of the Year Award

AN annual award to the Girl Technician of the Year is to be made jointly by the Caroline Huxlett Memorial Trust and the Institution of Electrical and Electronic Technicians Engineers. The amount of the award is to be £250, with no conditions as to how it is to be spent.

The aim of the award is to draw attention to electrical and electronic engineering as a career for women. The winner will be a girl who has not only undergone technical training but has shown that she can hold down a responsible job.

The closing date for nominations is October 1. Further details can be had from Joan Ashton, IETE, 2 Savoy Hill, London WC2R 0BS. Tel: 01-836 3357.

David Redhouse, previously a management consultant with Harrison Computer Services, has been appointed to the board.

Tony Golborn of Systems Designers Ltd has moved into sales, as sales executive, from the advanced software group in which he was a consultant.

Alec Marsden, distribution consultant at British Road Services, has been appointed group consultancy manager, which includes functions such as development and application of computer techniques to transport operations.

Peter Easton and David Morton have been appointed associate directors of CMG (City of London). Both were previously employed by CMG, Easton as senior systems and programming consultant, and Morton as project leader of the Payfact team.

Pamela Goodman of VIP Consultants International, previously head of administration, has been appointed chief executive and senior associate with total responsibility for the overall operation of the business.

Paul Mithven has rejoined RTZ Computer Services, where until 1977 he was commercial systems manager and technical manager for the Value Systems, as systems development manager. In the intervening period he has been DP manager with Norman Miller.

Wallace Avery has been appointed area manager, bank operations in NCR's finance and government division. He was previously a district manager in bank operations.

Chris McCarthy, senior sales executive with Cara Data Processing in Ireland, has been promoted to head of sales, computer sales division.

Raj Prasad has joined Systemsolve as a consultant in the Northern office, from Gemini where he was a senior programmer. David Sands, previously a project leader with the University of London, becomes a consultant in Sunbury-on-Thames with Systemsolve, and Michael Rigby joins the company as a senior analyst/programmer from John Courage.

John Morgan has joined J. M. Factors as paper products manager, from Wiggins Teape where he was technical adviser to the IDEM marketing department.

Tony Crossley, previously print area manager with ICL, has joined Software Sciences Compro as marketing manager.

Thomas Howard has joined the data products group of ICL in the US as vice-president, finance. Previously he was assistant corporate controller of Fairchild Camera and Instrument Corp.

Jim Kane, general manager of Computer People Com, a VLI company, has been appointed managing director. Mike Singleton has joined the company as sales executive in the Home Counties, from DEC where he was senior commercial accounts representative. Roger Smith, previously a sales executive with Gensetner, has joined Computer People Com, as a sales executive in the South-East.

Pat O'Donoghue of Cara Data Processing in Ireland, has been promoted from senior sales executive to head of sales, bureau sales division.

Stuart Ramsden becomes systems support manager for Redifon Computers' Northern branch. Previously he was supervisor, field operations in the company's technical information organisation. Dean Webster, previously a systems analyst for central accounts with Redifon, becomes systems support manager for the financial branch of central accounts.



Jim Jackson

### Jackson to board

CUSTOMER services manager of Computer Technology Ltd, Jim Jackson has been appointed to the board. It is the first time that a divisional manager has been made a director within CTL.

Jackson joined the support department of CTL in 1971, and became successively hardware support manager, product development manager and UK service manager.

In 1977 the customer services division was formed from hardware and software support training and installation planning, and he was appointed its manager.

## MICRO NEWS

# Lack of European effort at Geneva exhibition

THERE were few innovations on show at the International Microcomputers, Minicomputers and Microprocessors Exhibition and Conference held at the Palais des Expositions in Geneva last week. Although some new products were being demonstrated, most of the companies taking part were exhibiting in their roles as agents or distributors for UK and US manufacturers.

What was new from European sources, however, was of considerable interest. Two new developments, one from Norwegian-based Mycon, and the other from Data Applications International in Brussels, use the new Advanced Micro Devices 9511 floating point maths chip. This device offers 16 and 32-bit floating point maths with hardware add, subtract, multiply and divide, together with a wide range of complex mathematical functions, and the ability to interface with a standard 8-bit data bus.

Mycon uses 9511 as an option on its new DIM 1003, Z-80A based CPU card, one of three new cards being added for use in the Mycon-1 microcomputer system.

The card features 4K bytes of static RAM, 12K bytes of EPROM, two serial asynchronous/synchronous interfaces for handling multi-protocol communications such as HDLC, SDLC and IBM BISync, and two bi-directional parallel ports in which each has eight data lines and two hand-shake lines. The optional AMD 9511 is used to provide a 24-bit hardware floating point maths capability.

The other two cards from Mycon are the DIM 1035 disc controller, and the DIM 1092 communications processor.

The disc controller can operate with hard disc systems of up to 50M bytes, and in the company's own systems configurations, it is generally used with either Perdisc or CDC disc drives. The card has 24 I/O lines available, and with an 8-bit processor based on two 2901 hit slices offering a 200 nanosecond instruction cycle time, is also capable of being used for front-end processing tasks.

The communications processor can be used either as part of a Mycon-1 system or in stand-alone mode. Based on the Z80A, it features 16K bytes of dynamic RAM, 2K bytes of EPROM and two serial asynchronous/synchronous interfaces for handling HDLC, SDLC and IBM BISync communications protocols. Baud rates are from 50 to 38,400 baud.

Data Applications International has introduced the AMD 9511 in a range of low-cost controller cards called RCS — the "Real-World" Control System, and five versions have been produced to meet a variety of applications.

They are all based to some degree on the first version, the RCS-K kernel module. This uses an Intel 8085A microprocessor together with the AMD 9511 for scientific floating point maths functions. The kernel features between 4K and 8K bytes of PROM space, between 1 and 4K bytes of RAM space, five external vectored interrupts, optoisolated serial I/O interface with programmable baud rates, and an on-board power supply to run from 24 volts.

The other four versions that make up the family of cards are the RCS-GCM general control module, the RCS-ACM automation control module, the RCS-PIC position and temperature controller and the RCS-ICM instrument control module.

Following the "real world" theme, the company is also shortly to launch a new "Real World" Basic interpreter. Intended for the same process and industrial control applications for which many simple Basic interpreters have been written, the DAI version is said to include input/output and interrupt functions, which the company claims are not available on other simple Basics.

The problems of developing microcomputer systems using a variety of different microprocessors was demonstrated at the exhibition by a US company, Boston Systems Office Inc, currently looking for a UK agent.

BOSI provided information on a recently introduced multi-user, multi-microprocessor software development system that is capable of operating with some 30 different micros.

It is in fact a software package that can be run on any DEC System 10 or System 20, PDP-11 or Data General computer system. According to BOSI president, Michael Kouney, up to 50 users can work with the system simultaneously.

In addition to the complete software development package, the company is also offering some of its constituent parts, such as cross assemblers, linkage editors and separate debuggers, as separate items.

As well as selling the packages, BOSI has them available on international time sharing services.

For companies that have existing microcomputer development systems, BOSI can also provide the necessary interfaces to enable the user to directly down and up line load to and from the system.

## \$3.5bn 'personal' growth

PERSONAL computer market worth \$3.5 billion by 1982 is one prediction to emerge from the ICA.

According to an analysis of the personal computer industry produced by a California-based market research firm, Creative Strategies International, shipments of personal computers are set to jump over 540% this year, rising from 43,000 units in 1977 to an estimated 276,000 by year end. It predicts that by 1982, the rate of annual unit shipments

will have risen to 1.2 million computers.

To make up this massive growth, the analysis predicts that the major markets will be found in the home programmer and the very small business sectors. Further equipment developments will be needed to help make this growth possible, and several industry observers have stated that the concepts of the conventional computer must be re-examined to make way for an "information utility."

## Edited by Martin Banks

# DIY show reflects growing interest in 'personal' market

THE growing interest in personal and small business computer systems continued last week at London's West Centre Hotel, where the DIY Computer Show was held. Although originally intended as a showcase purely for the DIY enthusiast, the exhibition had been spread to cover the small business systems area.

The DIYer was not without some things to see, however. On the Bywood stand for example, the company was not only showing its existing Scrumpl 3 Microcomputer, but was also talking about the next development, the first prototypes of which are expected to be ready in about two months.

Known as Scrumpl 4, it will be a single board microcomputer kit with an expected retail price of under £150. It is one of the first announced applications for National Semiconductor's 32K bit ROM holding the 4K byte National Industrial Basic Language, and the board will also feature a socket for National's 64K bit ROM. Memory capacity will be 8K PROM and up to 8K bytes of RAM.

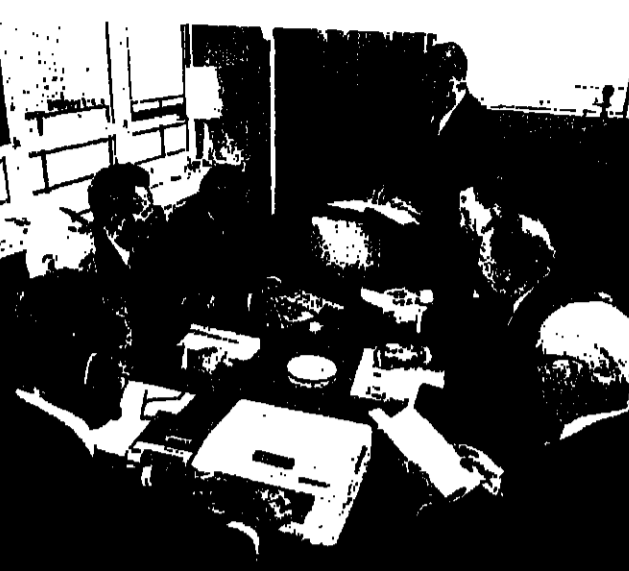
As well as being used for hobby-computing and as the basis of a home computer, Bywood also expects a market in low volume OEM areas. As with other Scrumpl kits, Number 4 will be based on the National SCMP processor.

For those with cash in hand, a stand worth a visit was that of Jade Computer Products, of Lawndale, California. On hearing about the show, the company arranged to fly over from the US with a range of hardware and books to sell off at the stand. These included a Shugart 801A floppy disc drive for £305.50.

Getting a first public showing at the DIY exhibition was the recently introduced single card computer from Cromemco. Displayed on the stand of Comart, Cromemco's UK agent, this Z80 based system is specifically intended for the OEM process and industrial control markets.

To increase its penetration into this market, Comart is planning to enter the manufacturing field with a backplane board and chassis system for small OEM quantity applications. First samples of the S100 bus back-plane are already available, and the complete package should be ready for sale in about two months.

On the software front, the company now has available a modified version of the Cromemco 16K Basic that accommodates use of the North Star floating point maths card.



Small computer systems are now gaining the interest of some of the world's largest companies, and the consumer Products Division of ITT has taken on board the Apple II machine to sell as its own ITT Computer. Seen here in a business environment, the system had its first public demonstration at IMM in Geneva last week.

From the development system's in-circuit emulator, a system that created a considerable amount of interest at the show was the new Rockwell AIM-85 advanced interface module, which was getting its first European public showing. The module, on the stand of Rockwell's Swiss agents, Aumann and Co AG, is a low-cost system intended as a "first entry" into microcomputing.

Based on Rockwell's version of the MOS Technology 6502 microprocessor used in the Commodore Pet and Kim-1 systems, AIM-85 is a fully assembled "complete" system featuring a full qwerty keyboard, a 20-column thermal printer, a 16-character display and teletypewriter and audio cassette interfaces.

Current prices being quoted for the system in the US are \$375 for the 1K byte RAM version, and \$450 for the 4K byte RAM version. The system has a built-in expansion capability for both peripheral add-ons and a full system bus, and both are compatible with the Kim-1 System. It will be available in the UK through Rockwell's agent, Pelco.

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Valves versus Transistors. Do valve audio amplifiers give better quality sound than transistor amplifiers?

Detector with a difference

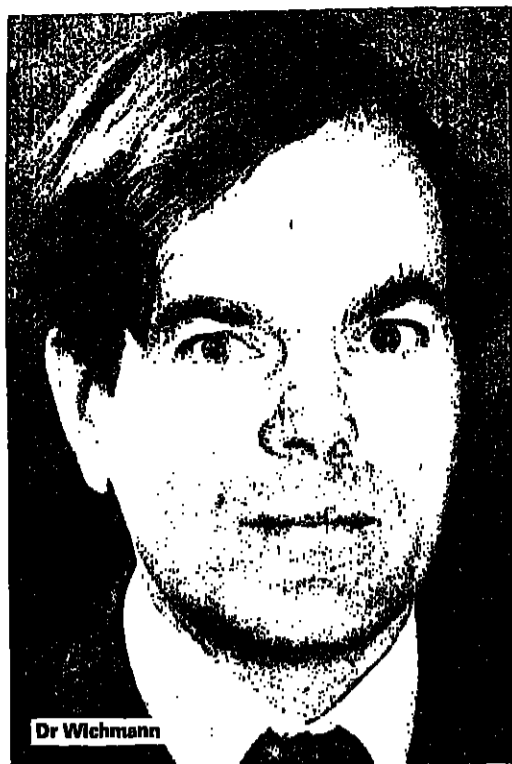
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ELECTRONICS TELEVISION RADIO AUDIO

# A mini problem for the US Ironman project

By Dr Brian Wichmann



The Pentagon's project to create a state-of-the-art language has attracted much attention. The last similar programme was the US Navy's development of a standard language for data processing. This resulted in Cobol and the fruit of the current work is likely to be at least as widely used.

In this article, Dr Brian Wichmann of the National Physical Laboratory reviews the progress made to date and examines some of the features of the language requirements and proposals. Dr Wichmann has been closely involved in European work on the development.

AS MANY readers of Computer Weekly will know, the US Department of Defence (DoD) has embarked on an ambitious programme to design a new language for "embedded computer systems" — ie in UK terminology, real-time systems.

A major objective of this project is to reap the benefits of standardisation. Whereas the UK Ministry of Defence uses only one high-level language, namely Coral 66, the US is currently using over 350 languages — about 250 different machine types.

The US has shown great interest in Coral 66 and the success of the UK Ministry of Defence in establishing it as a standard. However, it has decided to aim at a much higher level language, appropriate to the needs of the 1980s and beyond.

The project started about three years ago when an initial specification of the requirements for the language was produced under the title 'Strawman'. This was later successively refined in a series of documents called Woodenman, Tinman, Ironman, and Ironman (revised, July 1977).

The Ironman requirements were used to assess existing languages to see if any were appropriate as a basis for development. It was felt that PL/I, Algol 68, and Pascal could be used as base languages, andenders were requested for language proposals to meet the Ironman (revised) specification. In August last year four contractors were chosen, all using Pascal as a base language. In

February of this year the DoD published these proposals without identifying the contractor responsible. Each language was given a colour code so that comments could be elicited on the language designs without revealing the design team responsible.

It has now been decided that Red (Intermetrics) and Green (CII-Honeywell Bull) will continue working while Yellow (Stanford Research Institute) and Blue (Softech) will not. In the next stage the two contractors selected will refine their designs to meet Steelman and implement a pilot compiler.

It is DoD's intention to make a machine-independent compiler freely available and hence, after writing a few code generators, implementations of the final language should be available on a wide range of machines. However, the complexity of the language is such that compilers are unlikely to be very fast or small.

Hence, there may be problems in running the compiler in a typical minicomputer environment. On the other hand, the language designs do not assume the support of a large operating system and hence compiled programs could easily be run on microcomputers as well as the better microprocessors.

In what environments is the language likely to be most popular? Clearly, the relative benefits will depend upon current usage. Moving from Coral 66 would be a significant step forward whereas those already using RTL/2 may not find the

move worthwhile. Many real-time projects are still undertaken in assembly languages, particularly systems programming, and in this area the new language could have a significant impact.

The DoD has explicitly excluded from its study applications which are currently handled by Fortran and Cobol. Nevertheless it would also expect many scientific programmers to prefer the new language because of its better control structures,

**IT is the Pentagon's intention to make a machine-independent compiler . . . however, the complexity of the language is such that compilers are unlikely to be very fast or small. Hence there may be problems in running the compiler in a typical minicomputer environment**

data structures, and precision control.

What are the main advantages the new language would give? Many of the features are already available in Pascal and can be briefly summarised as follows:

- Good control structures (if-then-else, for, repeat, while, until).
- Good procedure structure, with nested scopes for variables.
- Powerful data structures without any run-time penalty. Arrays (of static size) and records can be freely used without garbage collection or a complex run-time system.
- Simple variables can have range limits imposed — permitting extensive compile-time checking. Typically an integer (I) is declared as being in the subrange 1..N and hence A[I] is valid if the same subrange is used to declare the array.
- Variables can be declared to be of a type which has only a restricted set of named values. For instance a variable of type DAY would have one of the values MONDAY, TUESDAY, WEDNESDAY, etc.

However, many further facilities are demanded by the Ironman requirements resulting in a language which is much more powerful than Pascal without reducing the capacity for compile-time checking. These additional features are as follows:

- 1 Data storage whose size is data dependent (like Algol 68 arrays).
- 2 Fixed-point data types
- 3 Control over the precision of floating-point data types.
- 4 General expressions to be evaluated at compile-time.
- 5 A method of handling exceptional conditions (which could be detected by hardware or software). This enables a programmer to conclude an activity cleanly in spite of unexpected errors.
- 6 Encapsulated definitions to reduce the visibility of names and increase the modularity of large programs.

types and no implicit conversions are available between types. Hence, the typing mechanism acts as a barrier between variables so that the user can be more confident the program does as he intended.

An Ironman requirement is that the strong typing mechanism should be preserved with separately compiled routines. Hence, the parameters of sub-routines will be checked in the same way as every other construct.

In spite of the progress made in two provisional language designs, many problems are not yet fully resolved.

For instance, Ironman required that "aliasing" should not be permitted. By this, one means that two entities given a distinct name in a program must be distinct. Clearly if two pointers X and Y both point to Z, then aliasing occurs between X and Y. Ironman did not require that this should be avoided, provided that Z was of a type that was always accessed via a pointer.

Now that individual microprocessors can be purchased very cheaply, the ability to exploit such systems within one language could be very important. The Red language contains a "monitor" system which allows mutually exclusive access to shared data from parallel tasks. This is an important requirement when several tasks run on one computer (and hence share store). This requirement can be programmed using boxes in the Green language but the code would be more cumbersome than with the Red language.

The next phase of the project will last until April, 1979. The contractors will produce a more rigorous language definition and no doubt revise the language in the light of comments received. A pilot compiler will also be produced for each language so that coding experiments can be undertaken to validate the language proposals. A final choice on the language should be made in 1979, but even then it will be some time before production compilers are available for general use.

Even with this relaxation, aliasing is very difficult to prevent in a language of the complexity proposed. For instance, if X is global and Y is a parameter by reference of the procedure P, then P(X) will cause X and Y to be aliased if the global X is accessible in P. The Red language avoided this by insisting that the procedure P imports X so that the call of P can be rejected.

All this may seem rather pedantic, but it is necessary if verification methods are to be used with large software systems. For instance, given a matrix multiplication routine, MUL(A,B,C) with C being the result; the routine will usually fail if C=A or C=B, but how many systems check for this?

Another interesting area

A major emphasis has been placed on the ability to perform as much compile-time checking as possible. With many complex weapons systems, live testing is either very expensive or not possible at all. Hence, simulated execution (with checking) of formal verification methods is to be preferred. Good design — which is evident in the successful languages — allows a large amount of checking without placing an undue additional burden on the programmer.

For example, the programmer can insert a statement in his program — assert (boolean expression) — meaning that the stated condition should be true. If the condition is false, then the program will fail to compile, but if the condition cannot be verified by the compiler, appropriate code can be generated to check the condition at run-time.

Both Red and Green have "strong" typing as in Pascal — that is the user can define new

which will certainly require further consideration in the language designs is the handling of parallelism. The Green language is the only one to have a method of handling tasks which could be easily extended to a multi-processor system (with or without shared store).

In the Green design, each task has parameters called "boxes" which are data items whose contents are transferred on the basic primitives send and receive. The two tasks which communicate via a box are synchronized at the send and receive. There is no buffering implied by the mechanism since both tasks necessarily have space for the data transferred.

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## SMALL BUSINESS SYSTEMS

Although small business systems were first aimed, naturally enough, at small companies and first time users, they are now also accepted as key elements in the development of distributed pro-

cessing networks in large organisations. The continual reduction in the cost of minis and micros has meant that small systems have been able to take over much of the traditional VRC market and, at the

other end of the scale they are moving into the province of the lower ranges of mainframe. In this first article Keith Ruddle, of Arthur Andersen and Co, looks at the confusing choice now open to

users, and on following pages David Shirley, of Computer Information Centre, outlines software requirements, and Harold Lea, of the NCC, offers some guidance to newcomers to computing.

# Confusing choice in a growing market

By Keith Ruddle

THE smaller company, or independent unit of a large business, is facing an increasing number of choices at the lower end of the business computer market. Manufacturers of hardware, with minicomputers and microprocessors becoming cheaper by the minute, are now competing favourably in the areas where accounting machines and visible record computers were previously dominant.

Similarly, the overlap in applications between these newer machines and the traditional small mainframe products is becoming considerable. The result of these advances appears to be more confusion for the first time user. Furthermore, a new and large market of small businesses is being introduced to all the problems of dabbling in the industry: systems planning, design, implementation, operation, and support.

As an overview, one should first establish what "small business systems" really means, then look at some of the significant trends in the market, and finally highlight the problems to be addressed by the small computer user.

In common with the rest of the computer industry, terminology is applied loosely at the lower end of the market. A "small business system" generally refers to a small computer, probably operating in an ordinary office environment and performing commercial business applications. The hardware can range from visible record computers, through cassette systems, floppy disc systems, to disc based minicomputers and small mainframe machines.

Although this definition covers the whole range, the real changes and growth have been seen in minicomputers. Even here, the definition is blurred, and sometimes "minicomputer" is used simply to describe the phenomenon that has occurred at this end of the market. It is safe to say, however, that machines with desk-top terminals, and built-in data storage on disc have become the mainstream products, rather than expensive, new technology alternatives.

The traditional commercial applications are still prominent, such as order processing, accounting ledgers and statistics, book-keeping, payroll and then, to some extent, more sophisticated manufacturing planning and control. However, we now have to include the growing field of word processing as part of the revised attack on office efficiency and productivity. The final and very important use of small business systems as part of a larger network, often connected to a high cost mainframe, in this

case, the local processing remains as a small business application, with an intelligent computer at the local site. It is, however, linked to a mainframe either to provide co-ordination of business information through a central group function, or to have access to more powerful processing.

Technological advances in integrated circuitry have had an impact in several industries, from the calculator market through to microprocessors for controlling cars and domestic appliances. In the business computer market, the effect has been equally drastic, and will continue to push down the hardware cost per unit, and increase the processing capability. The stage of "a computer on a chip" has not yet been reached commercially, but is rapidly approaching.

These trends in hardware, by reducing the cost for the same, or better level of performance, are making decentralised and distributed processing economically sensible, and cost effective computer processing within reach of the smaller office. Simple disc based minicomputers with limited peripherals can now be purchased for under £10,000. Indeed, for this type of system, the peripherals — printer, store, screen and data entry terminal — constitute the major part of the investment. Processing hardware is becoming simpler with less need for manufacturers to design sophisticated control logic.

Two simple minis can be better and cheaper than one complex machine. The trend in processing cost can give each local manager a machine of his own, and he need not necessarily worry if it is not used to its full capacity. As product maturity comes to the minicomputer market, competition is getting tougher, with literally dozens of manufacturers producing cheap, reliable and flexible hardware. With such a level of competition, however, many of them will not be around in five years time.

The rapid fall in hardware costs is emphasising the high cost of software. Software development remains very labour intensive, and labour costs are increasing. It is only recently that improvements in minicomputer systems software tools have been made. Traditionally, minicomputers have supported simple operating systems and low level programming languages. Now, however, we are seeing the development of database management systems, real time systems development aids, and high level languages to assist the user.

Application software, to perform the business functions required, remains an area of significant cost and difficulty.

To provide a cost effective business application, packages suitably modified for particular customer needs have become an industry in their own right. Compared with simple accounting machines, however, small business systems can support complex, integrated applications which bring with them major problems in design and implementation.

With one or two notable exceptions, the equipment manufacturers have not been geared to providing the complete "systems service" that we are used to on the larger machines, including application software products and support. This has resulted in software or "houses" adopting an approach of providing the whole package of hardware and software. The original content with selling at a discount to this industry, and the latter deals directly with the final customer for all aspects of the system. This leads to a proliferation of apparently different machines based on the same central unit.

The number of potential users of small business systems is growing, and more companies than ever are becoming exposed to the pitfalls well known to personnel experienced in the industry.

Although expert advice is

available, prospective new customers still approach the decision to buy a computer with little forethought and planning. This results in not only a wasted investment but considerable disruption to a business that may well have been running smoothly. Smaller companies typically have no expertise in data processing and the same mistakes are repeated across many first time users. It is possible, however, for management to take the correct preliminary steps before making an investment decision.

First, in systems planning, which is really an extension of normal business planning, management can identify the major business priorities, and the overall systems objectives. The company must decide what overall systems improvements are being sought. Once some agreement and commitment is reached, then management should spend some time in educating itself as to how "small business systems" might achieve these improvements. The prospective new user often has little or no concept of what a computer is, or how it can provide "systems solutions".

Once this point is reached, then the second phase of developing a written systems specification can take place. For the unsophisticated company,



Keith Ruddle is a manager in the Management Consultancy Division of Arthur Andersen and Co. He works primarily with small and medium-sized manufacturing companies.

with no external assistance, this may not result in a highly technical product. There are, however, basic guidelines that can be followed, and the vital goal is to establish some form of statement of requirements before approaching the supplier of the hardware or software.

Selection of prospective vendors requires some basic criteria to be established. A questionnaire and checklist can be developed against which proposals

can be evaluated. This must cover all aspects of the supply, installation and maintenance of hardware and software, together with specific questions on installation experience.

Finally, before a decision to proceed is made, the benefits and costs must be established, together with a schedule of implementation steps, effort, and timescale.

A small business system is not easy to install and run, and should not be regarded as simply a grandiose accounting machine. The trend is, however, towards "turnkey" installation and simple operation. In these cases, the supplier or perhaps a contracted software house, provides all the program development effort and installs the machine. Training for operators is also provided.

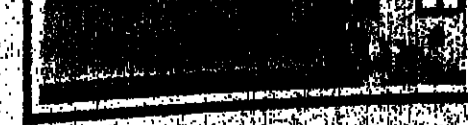
Even in this approach however, the local management must perform particular duties to ensure a successful installation: close monitoring of package design and modification to the specified requirements; full project control over timescale and cost; detailed participation on a comprehensive systems test; planning and organisation of the changeover or conversion activities; responsibility for providing full user participation; and finally, ensuring that support is continued after conversion.

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# How to choose your first computer

THE acquisition of a computer system should be treated by the first time user with the same amount of care as used in the selection of a wife. A mistake at any stage in the process can lead to a great deal of acrimony and disenchantment.

It remains a constant source of amazement to many members of the computer profession that extremely intelligent people, at a high level of management, treat buying computer hardware with less thought than the purchase of a washing machine.

For example, some senior executives of firms who are themselves in the business of selling, assume that in some way the marketing of computer equipment carries with it a pinnacle of honesty and integrity. This is not intended, I hasten to add, to imply that the selling of computer systems is in

any way dishonest. But it is rare in any form of selling to illustrate, much less emphasise, the possible drawbacks.

One firm, which is involved in the construction of houses, quite happily believed that, when the system had gone live, the software supplier would drop everything and instantly correct any software problems. It can only be assumed that repairs to their own houses were carried out in such a state of willingness.

From such stories that circulate concerning disastrous failure of computer systems, the reader may be left with the impression that the world of computerisation is beset by pitfalls left to trap the unwary. This may not be absolutely true but, with that thought at the back of your mind, a reasonable start has been made.

The purchase of a computer system contains many similarities to the acquisition of any piece of reasonably expensive machinery. The major difference lies not in the machinery itself but in the fact that a computer system will require programming. The computer programs will have to be written by people. More importantly, these programs will probably, even if it is only indirectly, be specified by you, the first time user with little or no computer expertise. If the requirements can't be defined by yourself, it is expecting a great deal for a computer specialist to provide good satisfactory solutions.

So, how do you go about acquiring the perfect computer solution to your current business problems? First you must be clear about the reasons for installing a computer. If the

existing manner of working contains little or no clerical discipline and problems are inherent, due to the type of staff or other valid reasons, these problems must be solved before computerisation is attempted. Computers will not solve the problems of organisations which cannot maintain a good manual system. In fact, the installation of a computer will only aggravate these problems.

Assuming that you have a reasonably efficient existing method of working, why should you computerise? Even if you know the limitations of the current system and can define the requirements of your computer system, what will it cost and is it practicable?

It is difficult for a first time user to have the necessary expertise to answer these questions and, therefore, it is recom-



**By Harold Lea**

How does the first time user go about the jungle of computer selection? Harold Lea (left) of the National Computing Centre, says it is an acquisition that should be treated with the same care as used in the selection of a wife — a mistake at any stage in the process could lead to a great deal of acrimony and disenchantment.

med that good, professional and independent advice is sought. This may appear initially to be expensive but then, mistakes at this stage can be extremely costly in the long term. After all, one is unlikely to satisfactorily cure toothache without resort to a competent dentist.

Thus, a feasibility study should be carried out. This will consider the likely requirements, benefits and costs of a computer system. The justification will then be a comparison of the costs against the benefits. Since the benefits may be tangible, reasonable to cost justify, or intangible, difficult to cost justify, it is up to the user to make the final decision as to justification.

If the outcome of the feasibility study has indicated that you should progress further, the next stage will involve a more detailed definition of requirements.

This will involve the identification of each application area such as sales ledger, purchase ledger, the volumes and type of input and output with timescales, the definition of computer record contents, etc. It is also important at this stage that a reasonable estimate of any future enhancements is made. All this information should be put in the form of a tender document against which suppliers may submit proposals.

The preparation of this document gives a two-fold advantage. Firstly, the definition of computer system requirements enforces a high degree of brain searching and discipline within the user's organisation. Secondly, because every proposer has been given the same information, a comparison of like against like can be made. As in the feasibility stage, professional advice is extremely useful, and probably very necessary, at this stage.

It is appreciated that the actual definition of requirements may be difficult, given a lack of knowledge as to the capabilities of computers but, even without advice, a serious attempt must be made. It is useful to define requirements with such phrases as "make the department / section / organisation more efficient."

The "how" and "why" behind such statements must be clearly understood, together with the necessary justification for each section of the requirements, even if this is not put in the specification. Computers, at all levels, have the in-built facility to reduce forests to woodchips and make millionaires out of paper suppliers!

After receipt of proposals, the selection process will begin. At this stage, if not before, the user will realise that the amount of jargon used and unnecessary literature that most suppliers produce, makes selection as easy as driving across Piccadilly Circus blindfolded.

Re-entrant code, virtual storage, swap ratio, unibus, megabus, etc — not only are the words confusing but it is difficult for anyone to compare the performance of two or more

machines that operate under different criteria under what are, necessarily, projected circumstances. Even something as simple as file storage capacity — 1,000 records each 20 bytes long makes 20,000 bytes of storage. Or does it? Any computer professional will say that this is not true, but it is this type of arithmetic that appears all too often in proposals.

So how does the first time user go about the jungle of selection? Seek expert advice. Even if the experts cannot be absolutely certain, they should at least be able to offer a high degree of safety in the sense that any machinery recommended will be at least as powerful as is required.

One reasonable method of selection involves the identification of factors which are important to the user. These factors are then graded in importance and each proposal marked. A multiplication of the scores and grades then gives a mathematical indication of the most satisfactory solution. There is obviously more to the final selection than the mathematical score but at least the reasons behind the score can then be identified and discussed.

Proposers should be asked to submit lists of existing clients. Ring as many as is practical, particularly to your area. Support can be very much area dependent.

The type of applications software that can be used falls into two broad categories. These are software packages, existing computer programs that will, for example, process a sales ledger, and a tailor-made system, consisting of new programs designed and written specifically for a particular client. Cost is generally a major factor in deciding which approach is to be made, although it is often a combination of existing packages and tailor-made packages which provides the most satisfactory solution and, therefore, cost may be secondary. Existing software packages are generally cheaper and have secondary benefits of being, in theory at any rate, tried and tested.

Common omissions when estimating costs include monthly maintenance costs, paper, desks, partitioning, operating system software, training, power supply, air conditioning and file conversion. Your £20,000 purchase is suddenly costing £50,000 to run over five years.

Successful installation of any computer system is ultimately dependent upon the complete involvement of all concerned, both user and supplier. The implementation has to be controlled in the same manner as any project, be it the erecting of a building or the installation of manufacturing machinery. Failure to control a computer system installation will create problems in excess of those inherent in any significant change in the manner of working.

Finally, when all about you appears to be falling into one gigantic heap, remember that computers are installed successfully and do produce extensive benefits.

# Prices cut too low for health of the industry

**By David Shirley**

DURING the past five years, hardware advances in the design of small business systems have been more dramatic and more publicised than in any other area of computing technology. The price of complete small disc systems in particular has fallen to the point where several suppliers offer a complete system — VDU, two diskette drives, processor, and printer — for less than £10,000. Ten years ago a system of comparable power would have cost £50,000; even five years ago it would have cost £30,000, so the improvement in price-performance ratio has been around 300%.

Unfortunately, although the price of the equipment has changed, its design principles and the systems and programming effort required to install it have not. The budget for software for an interactive disc system five years ago was in the region of £7,000 for one main application, ie about 20% of the hardware price. The same amount of software effort is still required today, and linking that budget to the rise in cost of living, one would expect software to cost at least £10,000 per main application. But this would represent 100% of the hardware price, and the potential buyer of a small business system will not consider such a software cost.

The computer industry is, therefore, faced with a dilemma you need: file creation and maintenance, file enquiry, stock receipts posting, stock issues posting, stock allocation, purchase order posting, file list, complete or selective and list of items which have fallen below reorder level.

It is totally impossible to specify, write, and test any one of these programs in less than a week. The minimum charging rate for programmer time needed to give a software organisation any hope of making a profit is £300 per man week. Thus the stock control application alone should cost £2,400 plus at least £300 to install it at the customer site and to train the operator. Multiply this figure by an average of four applications installed on each small business system, and the computer industry should be charging around £11,000 for software per installation.

In fact, it is charging less than half this figure. The difference is often made up by severe loss of profits by the supplier, and sometimes by impossible schedules, short cutting on program testing and lack of operator training.

How can we legitimately close the gap between what a user should pay and what he is prepared to pay? One possible panacea is the program package, written once but installed at many users. In theory, this approach should be viable at 90% of potential users, but reality is sadly different. Take an application such as sales ledger posting.

One user will insist that discount be posted separately from cash and that it should be shown in a separate column on the statement. The next user will object strongly to any reference to discount on his sales ledger. The result is not one package but completely different sets of programs for ledger posting and statement printing.

An even more fundamental difference between customer demands is that while most sales ledgers work on the "brought forward" principle with cash applied against the total balance outstanding and the balance for a particular period, a large minority of customers insist upon open item accounting which requires cash to be offset against individual invoices.

Even this variation plus discount variation means that a supplier has to produce four sales ledger packages rather than one, but in practice there are other variations in posting techniques and output formats which bring the total number of possible sales ledgers to about 20.

If standard packages are limited, what of the possibilities of a package generator where one fills in a few parameter sheets, punches them into a large mainframe computer, and out comes a specially compiled and tailored "package"? This approach can certainly work. NCR did it many years ago with BEST for the 315, and Burroughs repeated this success more recently with LINK for the 15000 visible record computer.

However, it takes a very long time and a vast budget to create a package generator, and hardware developments are now occurring so quickly that by the time a package generator was complete it would no longer fit the equipment.

The development of CIC's Executive 15 is a typical example. When it was launched in January 1977, it offered a "glass teletype" VDU with upper memory size of 24K, 2 or 4 diskette drives, and a 30 cps matrix printer. In April, 1977, the standard memory size had been increased to 40K and the print speed to 100 lines per minute. In October 1977, the VDU was changed to a model with upper and lower case and direct cursor addressing. In April 1978, a new terminal was added combining a daisy-wheel printer and an even more sophisticated VDU in one unit, including its own buffer of 7680 characters. In July 1978, a 10 million byte cartridge disc

will be available on it. Since the production of a package generator requires an elapsed time of at least one year, how can it possibly be produced against such a rapidly changing hardware background?

The truth is that the computer industry is cutting its prices too low for its own health or that of its customers. This lemming-like rush to the brink of commercial suicide is being accelerated by the arrival of the hobby computer which is fostering the illusion that a complete working computer system should cost less than a secondhand car.

In fact, the price of hardware which will work reliably for years in the environment of a

small user who is changing functions, programs, and stationery three or four times a day has probably reached its lowest viable level, particularly when one bears in mind the high cost of selling to the small business user.

Anyone who believes that a programmer is someone who translates simple business arithmetic into computer codes should read the Inland Revenue's latest publication Specification for PAYE Tax Routines — April 1978 Edition.

Today's systems programmer, therefore, requires almost as much financial knowledge as a chartered accountant and has to know his equipment, its

operating system, and programming language. Such knowledge is not easily, yet it must be, thoroughly and carefully if the installation is to operate successfully. The cost of a small business installation may shortly be irreducible minimum due to the cost of software and rather than by any factor.

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Now in its eighth year, Compec is bigger than ever in its new venue and features a wide choice of computer peripherals, small business systems and mini and microcomputers. Here are some of the 200 exhibitors:

- |  |   |   |
|--|---|---|
| Adler Business Systems<br>Amplex G.B.<br>Anderson Jacobson<br>Aspen Electronics<br>Basic Timesharing<br>Benson Electronics<br>Borror Electronics<br>Burnell Hill Electronics<br>CAI (Computer Automation)<br>Calcomp<br>CAP Microsoft<br>Centronics Data Computer<br>Cherry Electrical Products<br>Cifer Systems<br>Cole Electronics<br>Compelec Electronics<br>Computer Instrumentation Ltd. (CIL)<br>Computer Link UK<br>Computer Mart<br>Computer Workshop<br>Computer & Systems Engineering (CASE)<br>Conductron Peripherals<br>C. P. Clare Electronics<br>CPU Computers<br>Cramer Electronics<br>Crow of Reading<br>Daacell Group<br>Data 100<br>Data 100 Systems<br>Datalec<br>Data Design Techniques<br>Data Dynamics Services<br>Data Dynamics<br>Data General<br>Data Graphics<br>Datacube<br>Data Precision<br>Dataproducts (Dublin)<br>Data Recognition<br>Datasec<br>Datum Electronics<br>Delta Data Systems<br>Department of Industry<br>Dialco Systems<br>Dialco Electronics<br>Digico<br>Digit-Data<br>Digital Equipment<br>Documentation | Elbit Data Systems<br>Electronix Brokers<br>EMI Technology Data Communications Division<br>Euro Electronic Instruments<br>Eurocom Data<br>Exchange Telegraph<br>Fabrik Computer Components<br>Facit-Addo<br>Farnell International Instruments<br>Feedback Data<br>Fungus Computer Products<br>Garage Management Services<br>GEC Telecommunications<br>Geest Minicomputer Systems<br>General Audio & Data Communications<br>General Automation<br>Gevake Electronics & Automation<br>Gresham Lion<br>Hamilton Rentals<br>Haywood Electronic Associates<br>Hewlett Packard<br>Honeywell<br>Hypertron Computers<br>Imatic International<br>Incoterm<br>IDA International Data Automation<br>Intercom Computer Systems<br>I.S.G. Data Sales<br>ITT Business Systems<br>ITT Consumer Products<br>Jaguard Systems<br>J.M. Factors Computer Supplies<br>Kerwick & Jefferson<br>Kertronics<br>K & M Electronics<br>Lispac A Division of ITW<br>Logabax<br>Logics<br>Lynwood Scientific Development<br>Mallordate<br>Methorex UK<br>Micro Consultants<br>Midletron<br>Mint Computer Systems<br>Modular Computer Services Inc.<br>Naphus Computer Products<br>National Computing Centre<br>Newbury Laboratories | Nicolet Instruments<br>Paray & Giles<br>Pericom Data Systems<br>Peripheral Hardware<br>Perkin-Elmer Data Systems<br>Portec International<br>Poterborough Development Corp.<br>Plessey Communications & Data Systems<br>Plessey Microsystems<br>Post Office Peripheral Systems<br>Potter Instrument Co.<br>Pragma<br>Prestelco Hall<br>Pronto Electronic Systems<br>Quest Automation<br>R & H Applied Dynamics<br>Recal-Milgo<br>Rair Terminals<br>Raytheon Cossor Data Systems<br>Semaphore Computer Systems<br>SEN Electronics<br>Shannon<br>Sigma Electronics Systems<br>Shivrom Electronics<br>Storage Technology<br>3M UK<br>Tann Synchroscan<br>Telly<br>Télex<br>Tektronix UK<br>Telecomp<br>Telefile Computer Products<br>Teleprinter Equipment<br>Texas Instruments<br>Transdata<br>Transel Communications<br>Trivector Systems<br>Ultronic Data Systems<br>USCL<br>Vermont Research<br>Veratex Electronics<br>Weapac<br>Westrex Co.<br>Wilcox Computers<br>White Computer Supplies<br>X-Data<br>Zygal Dynamics Limited |
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Registration at the door costs £2, but free advance registration tickets will be sent if you return the application before 10.00 am on the last day (November 22).

Please send me free pre-registration tickets for Compec '78, which will save me having to pay £2 at the door.

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Address \_\_\_\_\_

To Compec Tickets, Room 821, Dorset House, Stamford Street, London, SE1 8LU, England.

**COMPEC'78**  
 December 5, 6 & 7, National Hall, OLYMPIA, LONDON

Jolly via IFA

# Need for a national museum of computers

AM writing in the hope of encouraging better contacts and co-operation between schools and industry. At this school, through the generosity of several local firms, we have acquired a PDP-8 and ancillary equipment. We have no financial resources for computer equipment but we would be interested in surplus equipment. We may have and would be willing to donate, either to maintain the school's computer activities or for a small museum of computer technology we are repairing.

In the course of obtaining

## Clearing doubts on post codes

OUR readers have been misled by Ron Lindsay's marks in our article "Doubts over Post Office coding" (CW, 25). His claim that postcodes as a business reference system is still some way to go before it is workable, is just not true.

The system is widely used by

hundreds of firms and organisations. Nor is there any

in his assertion that future

equipment for our museum, it became apparent that many historically significant pieces of hardware were being discarded. It seems obvious that there is a serious need for a national museum of information sciences and computing. A single gallery in a major museum, as exists at present, is insufficient to be at all representative.

The computer is revolutionising society and historical material relevant to this is fast disappearing or in some cases has disappeared.

Given that many colleges of education are being closed

down, leaving excellent buildings available, one of these could surely be a potential site. The value of such a museum for educational purposes and future historical and sociological research would be considerable.

Even if the idea of a national museum is not original, I would be interested in the response of Computer Weekly readers to the idea.

**M. J. COOKSON**  
Head of Computer Studies  
Nicholas Breakspear  
RC School  
Colney Heath Lane  
St Albans

changes to the system may be needed to cope with growth. From the start, it was specifically planned to cater for expansion and to last at least until 2001.

As numerous businesses have found to their advantage, the postcode file is the most comprehensive reference system in the UK with unique facilities for keeping it up to date and with an ability to identify even in-

dividual properties if needs be. It is not possible for me to extol the benefits of postcodes here but if your readers are interested, a free booklet entitled "Using Postcodes in Business Systems" is available from Postcode Consultancy, Postal Headquarters, London, EC1A 1HQ.

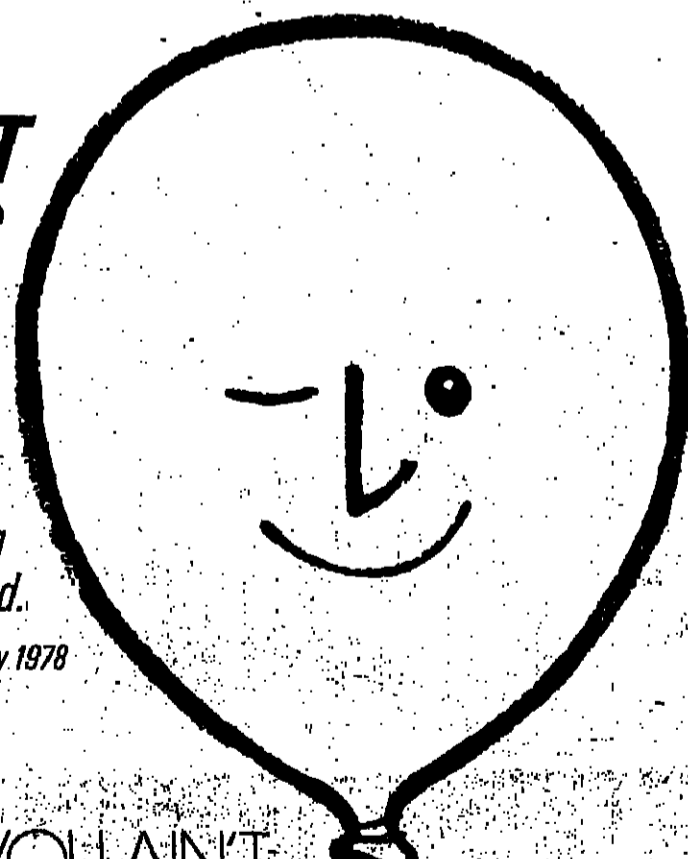
**PETER H. YOUNG**  
Central Headquarters  
Post Office  
London

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\*N.B.A.C. Businessman Readership Survey 1978



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# LETTERS

To: The Editor, Computer Weekly,  
Dorset House, Stamford Street, London SE1 9LU

## Chance to influence Cobol development

SOME good points are made by Don Mills in his letter on the proposed CODASYL SCL specification (CW, June 8), but he is off-target in some of his examples.

I have heard a number of explanations of the requirement to support 18-digit arithmetic in Cobol, but the size of a particular machine's arithmetic registers is not one of them. My favourite explanation is that 18 digits were necessary to represent the number of cents in the US Gross National Product, in the early 1960s.

**PETER H. YOUNG**  
Central Headquarters  
Post Office  
London

There is an in-line loop facility in the current Codasyl Cobol Journal of Development and I know of no reason why it should not be adopted for the next version of the ANSI Cobol standard which, at present, is being developed by ANSI.

ANSI was due to begin consideration of Procedure Division elements only in March this year, and it is unlikely to have completed this task in the two meetings since then.

In the longer term, anyone wanting to influence the development of Cobol or the Common Operating System Control Language, can write to Codasyl at PO Box 1808, Washington DC, 20013, USA.

**PHILIP R. BROWN**

Larbert  
Stirlingshire

## Britain—2000 AD

CONGRATULATIONS to David Butler on his winning essay (CW, June 15). Lateral thinking leads on to placing all the Green Circle Plan people in underground houses — before 2000 AD.

A group I was once associated with, calculated that the whole UK population could go into individual "detached" underground houses on a quarter-mile grid.

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**BOB INGHAM**  
Warrington

## Being fair to the PO

I WAS interested to read Focus on the treatment of the Post Office at a recent DPMA conference (CW, June 15).

The problem of the representation of monopoly organisations at independent conferences is an exercise in treading the narrow line between providing a sales platform and promoting a kangaroo court. This problem is exacerbated in the case of the Post Office, since every DP manager has his own horror story about telecommunications services in this country.

Just because the Post Office is a monopoly, however, and because its services are essential to business life, it is extremely important to have a balanced view of their present facilities

and future strategy.

In our conference next September, "Post Office Telecommunications — the way ahead" we have tried to achieve this balance by involving the PO in the development of the event. Its presentation will be subjected to critical examination from major users and consultants and, during informal sessions, from any participants with something to say.

While this may not be the perfect forum, at least the prisoner is allowed to speak on his own behalf before sentence is passed — whether you consider the prisoner to be the Post Office or the user.

**NEIL A. JAMES**  
Information Studies Ltd  
Chorleywood

## Politicians wake up

From front page

The chairman of the working party, Eric Hammond, said it was necessary to reverse the current dependence in the UK on imported integrated circuits, and added: "The rich nations of the future will be those with their own microelectronics industries."

The report pointed out that there could be major financial returns for the UK from micro-based equipment sold on world markets but it was essential that the industry should have direct access to the latest technologies

## The value of standards

YOUR report of the international conference in Paris on standards for computer users (CW, June 15) mixed up two separate points I was making.

First, there are currently about 350 authoritative standards relevant to the use of computers. About 25% of these are upgraded or amended each year, and there are about 80 new projects in hand. The only source of information about these is a feature in the Computer User's Year Book.

Secondly, I contrasted the achievement in establishing standards by the CCITT, which now has about 65 data transmission standards, some of great sophistication, with the ISO performance in data transmission. The ISO group has produced over 1,600 documents but only 11 standards.

The CCITT workers know the value of standards, but computer people are not so motivated. However, at a recent ISO meeting, the UK challenged the others with these facts, with remarkable results. So we may now expect an improvement.

**HUGH MCGREGOR ROSS**  
Chairman  
Data Processing Standards Committee  
British Standards Institution

## Too easy for some

I WAS puzzled by Puzzler's answer (CW, May 15). You really didn't have to go to all that trouble — any self-respecting soccer maniac knows that if you lose one match and have only one goal scored against you in three matches, you must have been beaten one-nil.

Please make future puzzles even easier, since I don't have the time to work them out!

**STEPHEN WATT**  
DP Manager

Wavin Pipes  
Dublin

It would be ideal if we could devise a method of verbal communication between machine and man, and apply this same system to inter-machine communication. This problem is the target of a one-year project which is being carried out jointly between Frank George, Professor of Cybernetics at Brunel University, and Tom Addis, a research worker at ICL's Research and Advanced Development Centre at Stevenage. It is hoped that both ICL and the Department of Industry may become involved in the project at a later stage.

In this article, Professor Frank George looks at what the problems are and the way things may go.

Author of many books on computer-related topics, he was editor of Science Fact, a book which presented the latest achievements in the diverse fields of technology and science. One of his latest books is Machine Takeover, which looked at the dangers represented by the emergence of machine intelligence (Futureview, January 12).

# Machine shall talk unto machine

## By Professor Frank George

THE search for suitable interactive languages for man-machine interaction has been going on for a long time and has taken many different forms. I am mainly concerned in this article with the latest attempt, which is now going on, to find an automatic speech recognition system. But behind this effort lies a whole world of diversity.

It has been realised for several years now that to have a satisfactory human-like system (artificial intelligence) required that it has access to a natural language.

This implies, for simulation purposes, the need not merely to use, but to learn to use, such a language. For synthetic purposes — this is where the spin-off and the focus of this article is — the problem is enough to be able to converse in a natural language.

With this in mind, we immediately find a crop of such written languages that have grown up in the last 20 years, and one can think of some like Namer, Baseball, Sir, Oracle, Lip plus a whole lot more besides. These "conceptual" languages provide the necessary backcloth to the search for an auditory form of recognition.

The languages themselves fall into four categories, those with and those without syntactic analysis, and those with and those without an inference making capability.

Most of the languages use list processing computer languages, but this is really incidental to their capabilities.

They have the ability to make a question, for example, and after interpreting the question, supplying the answer by searching the associated database or by making inferences from the information in the database.

An example would be a question like, "How many sub-items X have you in store Y?" The analysis of such a statement tells us: 1. It is a question; 2. "How many" is the interrogative phrase; 3. "Sub-item X" is the key noun and 4. "Store Y" is the important auxiliary.

One automatically calls up

the routine for "how many," which immediately searches for "how many what?" The noun follows "how many," and if there is a further part to the sentence such as "in store Y" then this immediately is encoded into looking at X (row) and Y (column) of a matrix, say, where the number is found and the answer "we have 403 sub-items X in store Y" is printed out.

There is the very minimum amount of analysis involved, but it can in some circumstances be much more complicated. It sometimes needs to be more complicated to avoid the vagaries of actual linguistic usage.

Even when we define terms and can answer questions like "what do you mean by Z?" the difficulty remains that so many terms are defined by the context in which they are used.

Now if we change the modality of the recognition of the spoken word — granted a similar subsequent analysis — we have the new difficulty which we do not meet, of course, where the words and phrases are typed into the computer.

The recognition is now of phonemes and other units of speech that can be distinguished and which we distinguish in human conversation. We can already do this for a single word and the current search is for connected speech — the recognition of a complete sentence.

The difficulties encountered in machine translation problems over the written word occur here again, since it is both a problem of pattern recognition and a problem of understanding. The pattern recognition part of the problem depends upon the ability to recognise at least 40 phonemes in English of which 10 are vowels and 30 consonants. This is indeed a lower limit to what is required, since each phoneme can be analysed further into 10 distinctive features which recur in all the words of a sentence, and they recur in different patterns.

The consonants are further grouped into "voiced" and "voiceless," whether they are stops, fricatives, nasals, etc

(points of articulation) and bilabial, dental, etc (manner of articulation). So the recognition of a single word is a major problem in itself.

The further step is the recognition of words connected into sentences. This can be thought of as a Markovian problem in the sense that we know that each word in a sentence acts as a constraint on the other possible words.

But the recognition of this fact itself depends upon a measure of semantic clarity; so one might expect to invoke a field which has hardly been developed as yet — the semantic theory of information.

The fact certainly remains that if we can recognise a word we must be able to recognise a sentence; it is largely the



Most of the languages use list processing computer languages, but this is really incidental to their capabilities.

semantic complexity of the problem that is daunting, and made especially so by the need to link such automatic speech recognition to problem solving and logical considerations which ordinarily occur with the use of natural language.

There are a whole lot of different approaches currently being made, but for my own part I would like to see the main attack concentrate on four aspects:

1. The pattern recognition problem with respect to phonemes and their sentence distribution.

2. A Markovian analysis of these distributions.

3. A semantic information — theoretic analysis of the statement; and

4. A heuristic approach to the most likely match between apparent phonetic patterns and the likely semantic context.

The relation of heuristic methods to induction and of both to semantic information theory suggests that such a trail is, to say the least, "warm" and one we hope to pursue.

A start has been made to this family of problems, concentrating on automatic speech recognition (Addis, 1972) and a good deal of effort has already gone into developing further this promising start, but it is notorious that problems of language so often lead us into the domain of complete human intelligence, so we must not

has initially to limit his "conversation" from the fully pragmatic, involving gestures and showing behavioural signs of intention and the like, while the computer has to enlarge his domain by use of new inputs (visual, etc).

At least then there can be a world, like the Winograd world of coloured bricks for building, or perhaps something more complicated, which would allow conversation.

The emphasis has now, for one aspect of these new developments, moved on to a symbolic form of problem solving, and this entails concept formation

and hypothesis formation

and, above all, the use of heuristic methods.

But the other aspect of the

present project lays the

emphasis on meaning and the

ability to understand what each

says to each (man and com-

puter) without now necessarily

being involved in problem

solving. Both aspects of the pro-

blem require an enormous

amount of research effort.

1. Science Fact, edited by Profes-

or Frank George. 340pp. £1.50.

Topaz Books.

2. Machine Takeover, by Professor

Frank George. Paperback 193pp.

£3.50. Hardback 107pp. £7.25. Perga-

mon Press.

3. Human Behaviour in the Single-

active Environment using a Single-

Spoken Word Recogniser, by T. R.

Addis. Man-Machine Studies.

CAD/CAM '78, the sixth US computer-aided design and computer-aided manufacturing conference and exhibit, will be held at the Hyatt House, Los Angeles International Airport, on September 18-21. The seven sessions will focus on new applications in technology and management directions. The sponsor is the Computer and Automated Systems Association of the Society of Manufacturing Engineers. Details from CAA/SME, 20001 Ford Road, PO Box 830, Dearborn, Michigan 48126, USA, tel: 313/271-7000, ext. 403.

IN Amsterdam, Efficiency Bears this year will be the tenth International Exhibition of Office Equipment, held at the RAI Exhibition Centre on October 10-18. Details from RAI, Europaplein 8, Amsterdam, Holland, tel: 020-5411411.

ARTIFICIAL Intelligence is the theme of a conference co-sponsored by the AISB and G8, to be held in Hamburg on July 18-20. Details from AISB, Dept of Computer Studies, The University, Leeds 2, tel: Leeds 31701, ext. 7284/7108.

A SEMINAR programme on the "State of the Art" is offered by Control Data Institute during July and August. Most of the seminars will take place in London, but also on the practical applications of microprocessors and microcomputers, and the structured design and programming workshop, will be held in Copenhagen and Amsterdam respectively, on August 3-4 and August 26-September 1. Details from Terence Barnard, CDI, 77 Wells Street, London W1P 8RE, tel: 01-637 2171.

THE seventh conference on mechanised information storage and retrieval systems will be held at the Cranfield Institute of Technology, by Inspec, the Information Division of the Institution of Electrical Engineers (IIEE) will take place on July 11-13. It is entitled Towards Intelligent Information Systems. Further details from Cyril

Clevedon or Tom Atkinson at Inspec, 122, Nightingale Road, Hitchin, Herts, SG5 1RJ, tel: 0462 83331.

TWO conferences, on non-invasive cardiovascular measurements and on computers in cardiology, will be held at Stanford University, Stanford, California, on September 11-12 and September 12-14 respectively. The sponsors, besides the Stanford University School of Medicine, Cardiology Division, include, for the first conference, NSA, and for the second, the IEEE Computer Society. Details from Mrs. REE Computer Society, Details from Mrs. Dr. M. C. Conference Coordinator, Stanford University School of Medicine, 301 Welch Road, Suite 303, Palo Alto, Calif 94303, tel: 415/497-7507.

CONVENTION Informatique 78, the International conference on data processing, will be held at the Palais des Congrès in Paris, on September 18-22. The conference is part of Sibic, the data processing, hardware, communication and office equipment exhibition. Details from French Trade Exhibitions, French Chamber of Commerce House, 54 Comedie Street, London W1, tel: 01-438 5804.

A VARIETY of courses on management systems development and systems analysis is offered by Urrick Management Centre at Baylis House, Stoke Park, Lane, Slough, Berks SL1 3PP, tel: Slough 34111. A brochure detailing courses within the framework of 1978 is available from the above address.

A BROCHURE of courses for systems analysts (from now until December) is available from John Haskings and Co. For details contact Valerie Burr, Course Rep, at John Haskings and Co Ltd, 91/93, Farringford Road, London EC1R 1BQ, tel: 01-462 1831.



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THE Institute of Data Processing and the Data Processing Management Association have now merged to become the Institute of Data Processing Management Ltd. Here the first chairman of the new Institute, **NEVILLE TAYLOR**, says that there is a membership of nearly 4,000, and he anticipates a growth rate of at least 30 per cent within the first year. He sets out the aims of the Institute and tells how DP personnel can join.

**Professional Institute to serve all levels of computer people**

Taylor

AFTER over 18 months of involved talks and negotiations, the merger between the Institute of Data Processing and the Data Processing Management Association has now happened. The new body that has emerged is the Institute of Data Processing Management Ltd.

Both DPMA and IDP have established a special position in the computer industry. DPMA being unchallenged as the practical association representing supervisor and management levels, while IDP created an unrivalled examination structure with a strong student membership which could be the DP management of the future.

With increasing awareness of the changing face of the DP industry, produced by distributed processing, mini- and micro-computers, there is a real need to recognise the broader base for recruitment to the IDPM, including user management, accountants, engineers and perhaps the new breed of DP enthusiasts, for whom personal computing becomes more than a mere hobby.

IDPM has a membership of nearly 4,000 and from the present flow of inquiries it is not unreasonable to expect a growth rate of at least 30% within the first year.

Entrance to IDPM can be gained either by examination or by acceptance of persons with the appropriate experience in DP. There are two professional grades, those of Member and Associate, and two intermediate professional grades of Licentiate, for those who have passed parts I and II of the existing IDP examination syllabus and with

at least two years' approved practical experience, and students.

In addition, there will be an Affiliate Membership, both individual and corporate.

A grade of Fellow may well be established by invitation of the Executive Council for outstanding service to the data processing profession.

The aims of IDPM are:

- To establish a professional body to safeguard and enhance the interests of its members employed in data processing;
- To secure and maintain educational standards for the profession by examination;
- To secure and maintain professional standards in data processing by promoting the effectiveness and status of those engaged at all levels in data processing; encouraging and assisting members to develop their careers within and beyond data processing; encouraging practitioner and management training and assisting in the provision of professional data processing education and training facilities;
- To provide a forum in which the interests of data processing may be discussed and to disseminate knowledge thereon;
- To foster and maintain a high standard of professionalism for the data processing manager and practitioner;
- To promote effective communications and links between data processing and other management functions;
- To represent the data processing industry nationally and to communicate members' views to government and the media;
- To encourage public awareness and knowledge of the beneficial uses of computers;
- To publish a journal at least quarterly.

Staff have now been recruited to handle the administration and secretarial functions of the Institute under the control of a Secretary-General, and will operate from the new headquarters in Henrietta Street, Covent Garden. It is, however, necessary to retain the existing DPMA premises at 27a York Road, Maidenhead, until such time as the handover of records, etc., is complete, and all inquiries should be routed via this address for the time being.

We trust that IDPM will continue to co-operate with Computer Weekly in the way practised by the DPMA in mounting joint workshops, seminars, etc. Two recent events which proved highly successful were the Communication Audit workshop presented by Nigel Laurie, which proved so popular that a similar project will be mounted in October of this year, and recently the flourishing Central London branch held an enlightening forum where the operational staff were given the opportunity to voice their opinions of their management. This proved to be extremely lively and provocative, and deservedly played to a packed house.

In combining the strengths and resources of two of the foremost bodies within the computer industry, the IDPM has provided a professional Institute of Data Processing Management to serve all levels of those involved in using computers as an aid to their business.

**SDL to define software standards for ESA**

STANDARDS designed to ensure software quality are to be defined by Systems Designers Ltd under a contract from the European Space Agency. The contract, worth £80,000, and expected to last one year, provides for the definition of standards for on-board software on unmanned space missions.

Reliable and fault-tolerant software is vital in such applications, where the scope for fault rectification is limited. This is particularly true for deep-space missions, which may be beyond the range of ground control.

A significant aspect of SDL work will be the identification of particular techniques for achieving the required level of fault tolerance. In addition, the company considers it essential that standards are based wherever possible on the use of computer aids for program specification, design, and implementation.

One task will therefore be the evaluation of existing tools in this area, such as Software Sciences' SDS system developed for RRE (CW March 29, 1973).

SDL, which already has extensive in-house experience of high reliability systems through its defence work, will also be topping up its team from outside. Specific expertise in specialised areas is to be provided by General Technology Systems, System Consultants and J. R. Taylor of the Danish Atomic Energy Commission.

**London borough orders 2960**

AS part of a five-year plan to develop online computer services for all its departments, the London Borough of Newham has ordered an ICL 2960. The £300,000 system will be used to develop major financial and personnel databases, and other business systems and applications in the borough's catalogues.

**Conference on Very Large Data Bases**

THE next International Conference on Very Large Data Bases will take place in West Berlin from September 13 to 15. This is the fourth in a series of annual conferences which have steadily increased in importance and it will be the second time it has been held in Europe.

The conference is intended to identify areas of general interest for research, development and application of database systems. Appropriately, it is to be held in parallel with the International Congress for Data Engineering, sponsored by the Berlin Data Authority.

Some partial travel grants are available to students of computer subjects and applications should be directed to Dr H. Weber, Bonn-Mecherzheden, Germany, 5300 Bonn 1, 1000 Berlin 33. The conference is also trying to reduce costs by arranging country flights.

**Would you buy a used DP job from this man?**

"No, seriously squire, lovely little number. Could be up to five grand a year... well, with a little overtime... well, with quite a bit of overtime actually. But anyway, the previous gent was very satisfied, very happy - he's in South America now they tell me. Still, this little Catchpole 69/1 1/2, it's lovely little machine, a real little mover. 'Course, the only system they've actually managed to run on it is the canteen menus, but Rome wasn't built in a day, was it?"

Ever had the feeling that the guy trying to sell you into a new DP job would be far more at home selling you a 1963 Vauxhall Cresta? Quite probably he has the same feeling, too. Because a lot of people have come into the DP recruitment market convinced they've found an easy way to make a fast buck. And a lot of people have been disappointed.

At Knight Computer Services, we've never had any such illusions. Because one of the things our long years in the computer business have taught us is that when you're looking for men and women to do a job and do it well, you can't afford to take short cuts.

So instead of talking you into a job, we'll listen while you talk about the sort of job you want, and why. (If you're going for a senior job, we're happy to bend our ears for anything up to an hour.) We'll put a true value on your experience, and a new perspective on your whole career. And because even in the computer business, people are still stubbornly individual, we'll get to know you as a person, not just as a list of qualifications and experience.

And of course, we'll make sure any job we put your way does things for your earnings.

So you could find yourself looking for a new car, instead of just another used one.

**Knight Computer Services Limited**

14 Old Park Lane, London W1Y 4NL  
Telephone: 01-491 4706

Please send me an application form:

Name \_\_\_\_\_

Address \_\_\_\_\_

Phone No. \_\_\_\_\_

**Knight** **01-491 4706**

Staff Services Division of BOC Datasolve Group and a member of Computing Services Association.

your kind of job.  
your kind of people.

**Is this what's stopping you going in for contract work?**

At Knight's we can offer you a little encouragement. As one of the largest DP contract staff organisations in Europe, we'll have no trouble finding you your first contract. And for much the same reason we'll be able to find you your second, and third, and so on.

But the most important thing is our reputation for keeping in contact with people once they've started their contract careers with us. Before the end of a contract starts getting uncomfortably close, you'll get a phone call from us offering you another contract, or more probably, a choice of contracts. So with us, the end of a contract isn't really the end at all. But the start of another one.

**Your Contract Career Starts Here**

**Programmer/Analysts**

Immediate/Forthcoming Assignments

IBM OS/VS1 SYS. PROG. - Holland	TASKMASTER + COBOL - London	DRIVER + PLAN - Herts.
FORTRAN + OS - Holland	DOS COBOL - Surrey	2900 CONSULTANT - Lon
DOS + OS SYS. PROG. - Holland	COBOL + IMS + TSO - Herts.	PDP RSX11 - Italy
MVS/SYS. PROG. - Geneva	ICL 2904 COBOL - Kent	MACRO11 + RSX11 - Herts
DOS COBOL - London	COBOL + G11 - London	FORTAN + RSX11 - Berk

Please contact Richard Kaluzynski or Sue Gillam on: 01-491 4706 or 01-439 3411.

**Operators/Overseas & UK**

IBM 370/168, 158 OS/VS2 Ops.	IBM 370 DOS VS POWER VS Ops.	OTHERS
IBM 370 - OS VS1 & HASP Ops.	IBM 360/370 DOS GRASP Ops.	Buttroughs Small & Medium System Ops.
ICL System 4/72 & 50	ICL 2903/4 Ops.	Honeywell Level 60 Ops.
IBM IBM Data 100	ICL 2960/VME/K Ops.	ICL Writers GCOS
IBM System 3 & 32 Ops.	ICL 2960/DME Ops.	Univac 1100 & 9400 Ops.
	ICL 2980/VME/B Ops.	Terminal Ops.
	ICL 1900 G11, 11+ & 111 Ops.	Various Contracts

For further details or advice call Sue Smyth, June Mogg or Jane Asbury NOW! on 01-491 4706 or 01-439 3411.

All vacancies are open to both male and female applicants.

**Knight**

**Knight Computer Services Limited**,  
14 Old Park Lane, London W1Y 4NL.  
Staff Services Division of BOC Datasolve Group and a member of Computing Services Association.

**01-491 4706**

**JBA****Terminal Sales Executive**

**London** over £10,000 on quota plus car  
Our client is a well known terminal manufacturer in the United States with an established operation in this country. Due to continued growth they wish to expand their sales force and are looking for a person with a proven ability in the terminal or computer services market. The headquarters of the UK company is southwest of London but the territory to be allocated will be in the City. This is an excellent opportunity for a capable sales executive as an early promotion can be expected.  
Salary and fringe benefits are above average. Contact: Jim Baker

**Systems Support Manager**

**Hertfordshire** to £9,000 + car  
A major computer manufacturer with interests in a broad spectrum of industry wish to strengthen their management team by appointing a Support Manager with total responsibility for the systems support department. The successful candidate will ideally possess an extensive software and hardware background with a proven record of managing a similar group. The company offers extremely rewarding and stimulating work, involving a high degree of personal contact at all levels.  
Essential qualities of the appointee will be the ability to communicate ideas and have an inherent positive and diplomatic personality.  
Contact: Jim Baker

**Lecturer**

**W. of London** circa £7,000  
Our client, an established d.p. equipment manufacturer with worldwide markets, wish to appoint an experienced software lecturer. The total work will include training both in-house technical staff and support analysts as well as personnel from new and existing customers.  
The appointee will be responsible for research, preparation and delivery of courses.  
Applicants should have a substantial track record in teaching or training with an emphasis on software, particularly mini ASSEMBLER, and at least one other high level language. An overall knowledge of the d.p. industry is very desirable and the ability to handle people and pressure is vital.  
Great job for a career minded, self-motivated person.  
Contact: Mike Creamer

For further information on any of the above vacancies please contact the appropriate consultant.  
If your qualifications do not match the above positions but you are seeking other opportunities please contact us anyway.

**JAMES BAKER ASSOCIATES, International Personnel Consultants**  
16 Maddox Street, London W1. Tel: 01-491 4478

**Project Leader**

**London** c. £7,000 - £8,000  
A small, but rapidly expanding, systems house has a requirement for a Project Leader to set up a team to design and implement a sophisticated reservation system using a Honeywell Level 6 mini-computer. Candidates must have experience of designing commercial on-line systems on minis and have a background of high-level languages. Ability to manage a small team and motivate staff is essential.  
This is a real opportunity to grow with the Company and career prospects are excellent.  
Contact: Jim Baker

**Systems Analysts**

**London/possible overseas travel** starting up to £7,500  
A major systems development project, involving a large database and teleprocessing network, is commencing with a leading international company. The team is being formed and vacancies still exist for Analysts with a broad commercial applications or systems background on any type of machine.  
It is highly probable that, as the staffing level expands into the project, original team members will progress into senior positions with correspondingly high salaries and responsibility (maybe in Europe). This is perhaps one of the most exciting projects being started in the U.K.  
Exceptional opportunity to get involved, maybe for the first time, in large database development work.  
Contact: Mike Creamer

**Support Programmer**

**London** up to £6,500  
This client, a leading insurance Company, is presently running two ICL System 4/52's alongside a new 2960 under DME and VME-B. They require an Assembler level programmer with at least 3 years' experience, preferably with a J operations systems background, to provide their operation department with technical support.  
This company's future computing needs will be 2900 based, so this is an excellent opportunity to get in on the ground floor and gain valuable New Range experience.  
Good career opportunities exist for those with drive and ambition.  
Contact: Andy Wright

ARE YOU GETTING ENOUGH?

★ **JOB SATISFACTION**★ **SALARY**★ **CAREER OPPORTUNITY****SYSTEMS ANALYST**

**LONDON**  
Our client, a prestigious Merchant Bankers are seeking a systems analyst who has financial/banking environment experience. They retain IBM 370 under OS but will consider other hardware experience. Co. offers:  
★ Full banking benefits including subsidised mortgage  
★ Excellent working environment  
★ Job security with prestige concern  
★ Salary £7,500  
REF. 1594

**HONEYWELL ANALYST PROGRAMMER LONDON**

Manufacturing company producing a wide range of household goods is seeking an analyst/programmer with at least 2 years' COBOL experience. The successful applicant will join a professional and enthusiastic team utilising Honeywell mainframe and preferably had GCOS experience. Co. offers:  
★ Excellent working environment  
★ Life assurance, BUPA, LVs and 4 weeks' hols.  
★ Discount on all company products  
★ Salary to £6,000  
REF. 1493

**NCR PROGS**

**C. LONDON**  
Major leisure group with turnover in excess of £200m seeks 2 COBOL programmers with approx. 2 years' experience to supplement their successful and professional programming team.  
★ Ideal opportunity for going on to analyst work  
★ Wide range of applications  
★ Accounting and other business systems  
★ Salary to £6,500 p.a.  
REF. 1522

**IBM PROGRAMMERS**

**CITY**  
International concern dealing in UK and Overseas has large IBM 370 hardware supporting an extensive TP network. Currently embarking on a wide range of new development projects, they wish to supplement their existing team with COBOL programmers with MINIMUM 12 MONTHS' experience.  
★ First-class career in data-processing with long-term prospects  
★ Excellent training and possibility of learning other language  
★ Excellent benefits include relocation assistance, non-contributory pension, STLS, LVs and Personal loan scheme  
★ Salary £5,000 p.a.  
REF. 1509

**ICL PROGRAMMERS**

**S.E. LONDON**  
Our client, a major and successful publishers retaining ICL 1901 seeks proficient COBOL programmers with one year plus experience and desire to strengthen their programming knowledge. Successful applicant will join a progressive DP team and be immediately involved in a variety of projects. Co. offers:  
★ FLEXITIME  
★ Exciting and interesting on-going and future development work  
★ Generous fringe benefits including pension/sickness schemes  
★ Overtime if required  
★ Salary to £5,000  
REF. 1611

**PL/1 PROGRAMMERS**

**W. LONDON AREAS**  
As part of a prestige international group of companies, our client is now recruiting for programmers with 2/3 years' PL/1 experience and hopefully some ASSEMBLER for the development of manufacturing systems on the IBM Series 1 mini computer.  
★ Excellent opportunity to be trained on mini computer  
★ Versatility of IBM Series 1 — relation to IBM mainframe  
★ Working with up-to-date technology  
★ Excellent career opportunities including chance of working with microcomputers  
★ Salary to £7,000  
REF. 1597

**MINI PROGS**

**CITY**  
Our client, a well established financial group, is setting up a new company to deal with a rapidly expanding area. This is a super opportunity for progs with experience on any mini hardware. BASIC would be an advantage but they will train on their own new language. If you want a CHALLENGE and to be involved right from the beginning phone NOV. Co. offers:  
★ Training in REXXIM & RSTS  
★ Great career prospects — promotion on merit  
★ Baking perks, free life assurance and LVs  
★ Salary £6,000  
REF. 1562

**SNR. ANALYST/PROG**

**W. LONDON**  
International company with outstanding reputation for efficiency, growth and investment are seeking senior analyst/programmers to work within IBM 370 installation. Good experience of PL/1 or COBOL or ASSEMBLER is essential together with ability to work on own initiative and supervise staff. Working on teleprocessing and time sharing systems with opportunity to work on small business machines. Co. offers:  
★ Excellent growth potential  
★ Excellent promotional prospects  
★ Non-contributory life Ass., sickness and pension scheme  
★ Good working conditions  
★ Salary to £8,000  
REF. 1508

For details of the above positions or any of the many others we have on our books—  
Telephone or write to our London office 01-734 0152/3010 24hrs.

**CONTRACT****OVERSEAS**

UNIVAC + DMS DATABASE  
BURROUGHS COBOL + DMS DATABASE  
CICS COBOL DOS VS  
FORTRAN TECHNICAL APP MINI EXP. PREF.  
DATAGRAPHS SPECIALIST  
SYSTEMS ANALYSTS BURROUGHS  
ICL GERMAN SPEAKING

HOLLAND £400 p.w.  
HOLLAND £400 p.w.  
HOLLAND £400 p.w.  
BELGIUM £400 p.w.  
HOLLAND £400 + p.w.  
HOLLAND £425 p.w.  
GERMANY £200 + full exp.

IMS COBOL PROGRAMMERS  
AN/PROGS IMS COBOL  
PDP II ASS OR MACRO II  
ICL GII COBOL  
IBM OS COBOL  
CICS ASSEMBLER  
IBM OS COBOL

**U.K.**

LONDON £230 p.w.  
BEDS £230 p.w.  
HERTS £230 p.w.  
MIDDX £180 p.w.  
BERKS £200 p.w.  
SURREY £230 p.w.  
SURREY £180 p.w.

Phone now for immediate and future contracts  
Ring Christine Kay/David Hayton 734 0152 (24 hrs.)

**KNIGHT PROGRAMMING SUPPORT LIMITED**

27 NOEL STREET, LONDON W1. TELEPHONE: 01-734 0152/6 (24 HOURS)  
OFFICES: AMSTERDAM, PARIS, MANCHESTER

Computing Services Association

**RPGII****Programmer/Analyst**

For permanent position in Cologne, West Germany

Salary package from £11,000 p.a.

Full relocation expenses provided

One of the world's leading manufacturers of ultra-sonic equipment has asked us to recruit an experienced Programmer/Analyst to join their installation in Cologne, West Germany.

An IBM System 3/15B has recently been installed and they are now at the very early stages of developing integrated manufacturing and costing systems.

We would be most interested in meeting you if you have obtained sound experience of RPGII and knowledge of systems analysis and design.

Although technical ability is of prime importance, you will also be expected to liaise at user level and therefore, a good working knowledge of German is necessary.

If you are looking for career development, then this will be a very positive step in the right direction as our client encourages everyone to realise their own potential both in and out of data processing.

For further information please contact Marilyn Black.  
Ref. 1724.



**JOHN GOLDSMITH (Computer Recruitment) Ltd.**

WE ARE ALWAYS INTERESTED IN HELPING YOU WITH YOUR CAREER  
John Goldsmith (Computer Recruitment) Ltd., 15, Buckingham Palace Road, London, S.W.1.  
Tel: 01-828 5366—24 hour answerphone service.



**SENIOR SYSTEMS** Kent  
The successful applicant will be responsible for the design and development of systems, programming, operations and user development in a professional environment. Seven years or more in D.P. 3 or systems with project management experience required. Large ICL installation.

**SENIOR SALES** All Areas  
Four to five years successful selling of business systems, VRCs, terminals or bureau services. Required for these vacancies. The successful applicants may work in London, Midlands, Hampshire or Sussex.

**SYSTEMS PROG.** London  
An expanding software house requires experienced OS programmers.

168 Finchley Road, London, NW3 8HP

COMPUTER WEEKLY, June 29, 1978

data scene

## CONTRACTS

LONDON  
U.K.  
EUROPE

TWO MONTHS TO  
TWO YEARS  
GOOD RATES + BONUS  
IMMEDIATE STARTS

CALL  
**BOB EDWARDS**  
TODAY

**Dalascene Recruitment Limited**  
Sceptre House  
149-173 Regent Street  
London W1R 7EB  
01-439 1856  
24 hour answer phone

HP Bulmer

## Systems Analyst

HP Bulmer Limited, the world's largest cider makers, require a Systems Analyst based at their head office in Hereford. Applications are invited from people who possess sound experience of accounting systems and the ability to 'speak the accountant's language'. In addition, it is desirable for candidates to have had experience creating models in financial and other spheres.

An excellent salary together with an attractive benefits package is offered, including a non-contributory pension scheme and free life assurance. Assistance with relocation expenses will be given if required.

Applicants should apply in writing to: Mr. A.R. Tough, Personnel Officer, HP Bulmer Limited, Rylands Street, Hereford HR4 9LE.

**Bulmers Cider**  
and a lot more besides

**COMPUTER PERSONNEL APPOINTMENTS LTD.**  
Career Specialists and Consultants for:  
**D.P. MANAGERS, SYSTEMS ANALYSTS, PROGRAMMERS AND OPERATORS**  
Midlands, Northern Counties and Scotland  
For application forms apply to:  
85 New Street, Birmingham B2 4PU. 021-643 0951  
or Tel 01-723 6334

## Software for Avionics Systems

CHELTEMHAM

The Aviation Division of Smiths Industries has a heavy commitment in programmed avionics equipment now essential to the operation of modern high-speed aircraft, both military and civil.

So we are rapidly expanding our software activity to develop a variety of applications employing the most advanced systems technology.

These positions will attract specialists at various levels up to senior, with several years' relevant practical experience and a degree or equivalent in electronics, computer science, mathematics or other related subject. This includes newly-qualified graduates aiming for top-position experience.

You would work with small project teams, have computer access and considerable responsibility for your part of the software.

### Real-time Airborne Software

Here you would design and program airborne mini and micro-computers for cockpit display, weapons guidance and flight control. A high level of job satisfaction—through direct contribution to aircraft performance and customer liaison—is assured.

### Support Software

backs the equipment activity with the design production, adaptation and maintenance of compilers, assemblers, interpreters and design/analysis/documentation tools for airborne computer programming—including the support of a growing range of micro-processors.

We offer attractive starting salaries, plus the full range of benefits customary in a major international organisation—including relocation assistance to this pleasing area of the Cotswolds.

If you are seeking advancement in a growth activity write to:

H. Upton, Assistant Personnel Manager,  
**SMITHS INDUSTRIES LIMITED**  
AVIATION DIVISION  
Bishops Cleeve, Cheltenham, Glos. GL52 4SF.

## SOFTWARE ENGINEERS

South Coast up to £6,000 plus full re-location

Our client, an international leader in communications and control technology, is looking for Software Engineers to work on any of the following:

DEC  
PDP11  
8080  
MACRO

CORAL  
ASSEMBLER  
RSX11M  
FORTRAN

If you have experience in any of the above and would like to start a new life in a beautiful part of Dorset, then why not ring John Davey on 01-581-1830 or 01-584-8476 or write Thurloe Executive, 30 Thurloe Place, London, SW7 2HQ, quoting ref. PCL/8. (Consultants Nationwide)

**Thurloe Executive**  
30 Thurloe Place, London SW7 2HQ  
Telephone 01-584 8476

PLACED BY THURLOE ADVERTISING

### UNIVERSITY OF ABERDEEN COMPUTING CENTRE

The University has recently installed a large Honeywell dual processor 66/80 system supporting a large terminal network. Applications are invited for the following positions:

#### 1. Information Officer

To take charge of the preparation and distribution of information for users of the system. Applicants should be graduates with several years' experience of use of a large modern computing system and preferably with experience of using computers in a University or research environment.

#### 2. Systems Programmers

To join the systems group which is concerned with the support and development of the software. Applicants should normally have a good honours degree and some years of relevant experience. Preference will be given to applicants with experience either of communications software or of the development of microprocessor applications.

#### 3. Systems Engineer

To be responsible for the control and development of the large communications systems within the University. Applicants should have an electronics qualification and several years' relevant experience.

Salary in each case on scale £3,600-£6,178 per annum (Grade 1A - Other Related Staff) with appropriate placing.

Further particulars for all posts from The Secretary, The University, Aberdeen, with whom applications (2 copies) should be lodged by 28 July 1978.

### CITY OF BIRMINGHAM POLYTECHNIC DEPARTMENT OF COMPUTER STUDIES AND MATHEMATICS BRITISH COMPUTER SOCIETY PROFESSIONAL EXAMINATION PART I AND PART II

5 term courses are offered on a day release and evening only basis for each part of the examination leading to Membership of the Society (MBCS). Suitable qualified candidates can enter directly into the second year of the Part I course. In addition, the department offers several short courses in aspects of Computing and Mathematics.

### HIGHER NATIONAL DIPLOMA IN COMPUTER STUDIES (Bachelors and Full-time)

Further details can be obtained from the appropriate Course Tutor, Department of Computer Studies and Mathematics, Franchise Street, Perry Barr, Birmingham B42 7SU.  
Tel. No. 021-368 8911.  
Application forms for the HND Course available from City of Birmingham Polytechnic, Admissions Section (CS), Corporation Street, Birmingham B4 7DZ.

### THE POLYTECHNIC OF WALES POLYTECHNIC CYMRU

#### COMPUTER CENTRE

Applications are invited from graduates or similarly qualified applicants for the following posts to work on the new DEC System-20 Computer.

#### SENIOR SYSTEMS PROGRAMMER

Salary £4,343.85p.  
£4,618.85p inclusive of supplements

The person appointed will form part of a team engaged upon the design, implementation and maintenance of Systems Software. Applicants should have had experience of modifying system software.

#### LIAISON OFFICER/PROGRAM LIBRARIAN

Salary £3,861.00p.  
£4,618.85p inclusive of supplements

The person appointed will be responsible for providing support to a variety of educational users. Applicants should have had substantial computing experience preferably in an educational establishment. Local Government Conditions of Service apply.

Please enclose large s.e.e. for details available from The Personnel Officer, The Polytechnic of Wales, P.O. Box 181, Pridd, Mid Glamorgan. Tel: (0443) 405133. Closing date: 17th July 1978.

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### SOUTH WEST WATER AUTHORITY

#### Directorate of Resource Planning

#### Technical Assistant Statistician

(Male or Female)

GRADE 1 (£1290-£2343 or 2 (£2442-£2748) or 3 (£2850-£3186) plus £312 p.a. salary supplement at age 18 and limited 5% supplement (Phase 2).

This appointment is likely to be in the upper part of the grade range and calls for a graduate with a minimum of one year's experience of statistics and the computer processing of sample data.

Applicants should be skilled Fortran programmers and be capable of developing statistical techniques and programmes with the minimum supervision.

Technical Assistant Temporary (Male or Female)

GRADE 1 (£1290-£2343) or 2 (£2442-£2748) or 3 (£2850-£3186) plus £312 p.a. salary supplement at age 18 and limited 5% supplement (Phase 2).

An appointment which for the present is considered temporary until March 31, 1978, is also available in the Statistics Section of the Directorate of Resource Planning. Computer programming and data handling are the main tasks and the holder of this post will be trained as required to undertake the work. A graduate in a technical field would be preferred for this post.

Application forms may be obtained from the Personnel Officer, 2-5 Barnfield Road, Exeter EX1 1RE (Tel. Exeter 54801), to whom applications should be returned by 13th July 1978.

Applicants should be graduates with several years' experience of use of a large modern computing system and preferably with experience of using computers in a University or research environment.

Salary in each case on scale £3,600-£6,178 per annum (Grade 1A - Other Related Staff) with appropriate placing.

Further particulars for all posts from The Secretary, The University, Aberdeen, with whom applications (2 copies) should be lodged by 28 July 1978.

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## Principal Technical Programmer up to £7,000 p.a.

We are a thriving new company now becoming a recognised force in the computer industry (and with the backing of CDC, NCR and ICL). Our labs are purpose-equipped for state-of-the-art development of computer peripherals. Our current development includes an advanced magnetic tape system.

This senior member of our technical software group will:

- take a key role in developing software for testing our high speed computer peripherals;
- be expected to make a major contribution to the technical planning and design of future software suites.

An extensive knowledge of programming mini-computers at assembler level for technical applications is required, together with an understanding of the hardware aspects of interfacing. (Data General Nova 3 computer experience is desirable). Experience in the design concepts and programming of microprocessor-based systems would be an advantage.

Telephone Morris Chudleigh on Stevenage (0438) 66561, or write to (for phone for an application form): Mrs. Rhianon Chapman, Personnel Manager, CPI Data Peripherals Limited, Bessamer Drive, Stevenage, Herts SG1 2DX.



CPI Data Peripherals Limited

## REAL TIME SOFTWARE

A vacancy has arisen for a Research Officer in the Control and Instrumentation Division of the Scientific Services Department based at Bockwith Knowle, Harrogate.

The successful candidate will join a group which is actively engaged in developing real time system software for hierarchical distributed micro and mini computer systems, to be used for on line data acquisition, display, monitoring and control of modern (generating plant).

Applicants, male or female, should preferably be in their twenties and have a good degree in computing science or equivalent qualifications. Experience with CORAL 68 is essential and familiarity with PDP 11 and/or TMS 9900 system software is desirable, whilst satisfactory experience with multi processor systems work would be most welcome.

Consideration will also be given to fresh graduates who can demonstrate initiative and enthusiasm, together with a desire to apply advanced computational techniques to the solution of defined system problems.

The salary will be within the following range £3614 p.a. - £7101 p.a. point of entry will be dependent upon age, qualifications and experience.

Applications in writing giving full details of age, qualifications, experience, present position and salary should be forwarded to the Regional Personnel Manager,

Central Electricity Generating Board, North Eastern Region, Bockwith Knowle, Oily Road, Harrogate, to arrive not later than Monday 17 July 1978.

Please quote reference SVN/472/CW

Central Electricity Generating Board - North Eastern Region

### MID GLAMORGAN COUNTY COUNCIL

County Treasurer's Department

#### SENIOR SYSTEMS ANALYST

(Systems Programming Team)

#### SENIOR SYSTEMS ANALYST

(Technical Project Team)

Salaries £4,759.56-£6,512.56, inclusive of nationally negotiated supplements and subject to further review in July 1978.

Commencing salaries will depend on qualifications and experience.

The Authority currently operates an ICL 1904S computer and is now actively planning for the introduction of a large ICL 2900 computer next year.

The post within the Systems Programming Team will involve all aspects of the implementation and maintenance of the VME/B operating system and utilities, together with the provision of technical support where appropriate.

The post within the Technical Project Team involves responsibility for the development of systems and the implementation of technical software mainly for Planning, Architect's and Surveyor's Departments within the County Council. This team is also responsible for a large examination processing system developed on behalf of the Welsh Joint Education Committee.

A minimum of two years systems experience, preferably of system programming or technical nature, as appropriate, and a relevant degree or recognised qualification are essential for both posts.

A flexible working hours scheme is currently operating.

The County Council's scheme for the payment of lodging and disturbance allowances and removal expenses will apply.

National Conditions of Service.

Application forms to be returned by 14/7/78 are obtainable from the County Treasurer, Mid Glamorgan County Council, County Hall, Cardiff.

Interviewing will commence.

## COURTS COMPUTER OPERATOR REQUIRED

South London up to £3,800

A vacancy exists for an operator with at least 6 months' experience on:

NCR CENTURY OR CRITERION

equipment. The successful applicant will be able to develop their experience working a 2-shift system on an NCR Criterion N-8870 operating under B3. Here is an opportunity to join a small team in a fast-developing installation with the prospect of transferring to programming at a later date. Further details from the Computer Services Manager.

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# OPERATORS

## CONTRACT and PERMANENT

We want YOU now for Permanent Positions at all operational levels, various locations, main frames and salaries.

Contract Assignments with a minimum £100 p.w. plus expenses.

Vacancies exist in all parts of U.K.

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## Re-Shape Your Career

South West Essex  
An international underwear manufacturing and distribution company making girl shaped girls, has to be mindful of the changes in fashion. However, the business foundation of the company is obviously a serious matter, and the development of a European systems network based on a Honeywell 84/30 is going to be a prominent feature in their plans. They require two experienced Systems Analysts to put this network into action.

### Senior Systems Analyst c. £8,000 p.a.

Reporting to the Director of Systems Consultancy, you will study key functional areas (particularly production control/planning and inventory management), analyse business problems and implement improvement plans. You will be supported by another Systems Analyst and liaise with departmental managers and computer users. Aged 30-40, you will have at least 5 years' business systems experience in a manufacturing industry and preferably a background of some M & M or work study/methods analysis.

### Systems Analyst c. £6,500

Working under the Senior Systems Analyst, you will assist in the study of business problems and implement new systems and improvement plans. You will work closely with other departmental managers and computer users. Aged 26-36, you will have at least 3 years' business systems experience in a manufacturing industry and some O & M or work/method study will be preferred.

In addition to negotiable salaries, both positions will involve travel in Europe and excellent opportunities to develop your career within the Company.

Please telephone or write for details to: Graham Beames or Marie Webster on Chelmsford (0245) 80234. PER, Cater House, 48 High Street, Chelmsford CM1 1DE.

Applications from both men and women are welcome.

## PER Professional & Executive Recruitment

Cambridge University Library Library Automation

### SENIOR VACANCIES

Two

# TEHRAN

## DON'T BE SHORT-CHANGED CHECK YOUR PACKAGE AND YOUR CAREER

### HIGH TAX FREE SALARIES PLUS FAMILY ACCOMMODATION AND OTHER SUBSTANTIAL BENEFITS

If you have Honeywell 8000 or Level 66 experience and are considering a term in Iran, then here are the best opportunities available. My client is one of the USA's leading Honeywell systems software companies and as such is able to offer the top packages for Tehran.

Consider the following:

### TAX FREE SALARY

— A generous tax free cash income of between \$27,920 p.a. and \$33,880 p.a. for personnel with 4-8 years' applications experience. Higher salaries are available for more senior and specialised positions.

### ACCOMMODATION

— The company provides a separate apartment for EACH employee, the size of which varies according to the family.

— The company pays for all utilities, e.g. gas, electricity, etc. with the exception of the telephone.

— The company provides a good standard of furnishings for the apartment including television, washing machine, fridge/freezer, etc.

N.B. The company budgets for an average of \$17,000 to cover first year rental and furnishings for EACH apartment.

### ADDITIONAL BENEFITS

- The company provides home to office transportation
- The company pays local school fees for children over 5
- The company pays Medical Insurance
- The company pays emergency home leave where necessary

### HOME LEAVE

— The contract is for 18 months' duration and a family trip home is paid for after 12 months.

### JOB CONTENT

— The company has been awarded a substantial contract due to its reputation for systems and software development based on Honeywell computers. The scope of this project ensures a high level of job satisfaction.

### FUTURE CAREER PROSPECTS

— The company is a well established systems software house and NOT just a bodyshop. Consequently, they view each new appointment as the start of a long term career through an initial assignment in Tehran. In addition to IRAN, future opportunities exist in the USA, UK and EUROPE.

### REQUIREMENTS

#### PROGRAMMER/ANALYSTS

— Minimum of 4 years' good experience in COBOL with applications knowledge of GCOS and JCL.

#### SYSTEMS PROGRAMMERS

— Around 8 years' experience in DP with extensive knowledge of GCOS, GMAP, TDS and/or NPS.

#### DATABASE SPECIALIST

— Around 8 years' experience in DP with extensive knowledge of GCOS, IDS, TDS and database design.

REF RW 24/1

CALL DAVID J. HUTCHINSON ON 01-499 4501 TO DISCUSS

### THE BEST OFFER AVAILABLE

# CREATIVE OPPORTUNITIES

## LONDON

My client currently operates a large twin IBM based bureau, specialising in systems for the advertising industry. They are soon to take delivery of an additional machine, a PDP 11/70 to cater for their expansion programme (future plans include ordering 2 more PDP 11/70's during the next 18 months). Enjoying the financial support of their parent public company, this thriving young subsidiary employs approximately 80 DP staff. It has good internal communications, with highly visible senior management and practices a "promotion totally on merit" policy. All the current systems are to be redesigned and rewritten to operate in an on-line environment offering a totally integrated package to cope with the needs of the advertising industry. Over 40 advertising agencies are serviced by these administrative and accounting systems.

## DEC PROGRAMMERS

£4000 — £6000 Basic +

### JUNIOR & SENIOR

The installation of a large disc based PDP 11/70 and the probability of 2 additional 11/70s in the next 18 months give rise to a heavy development schedule. Very interesting projects are to be undertaken including sophisticated on-line systems for the booking of TV time. The machine will operate under RSTS and use RMS II/K file management system.

JUNIOR Programmers will have the opportunity to develop their skills at a fast pace within a technically advanced environment.

SENIOR Programmers will enjoy significant responsibility in the development of sophisticated systems.

All Programmers will gain highly marketable experience within a very attractive company. Both positions require some exposure to DEC programming.

RW 28/2

## RSTS SPECIALIST MANAGER

£NEG

This person will be responsible for the generation and maintenance of machine software and the development of PDP applications programs by his team. He will be highly experienced in DEC systems and possess a thorough detail level knowledge of RSTS. This is a superb opportunity for a strong technician to develop his career into management through an interesting and challenging role.

RW 28/3

## PROGRAMMER/ANALYSTS

IBM DOS COBOL

To £6000 pa

In addition two Programmer Analysts are required to design and implement significant enhancements to current systems. This interesting project requires self-reliant, young professionals who can enjoy a company atmosphere which encourages them to use their initiative and imagination to the full. The steady pressure of an assured workload will enable you to develop your skills at your own pace. Planned growth will allow the company to accommodate fast developers.

RW 28/4

Call DAVID J. HUTCHINSON on 01-499 4501

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Telephone 01-499 4501

Grow with Telecomputing — nought to a £million in four years  
Over 130 users of TPS — the leading software for ICL online systems  
Over 60 staff working exclusively on the implementation of online systems on the ICL range

## Software Design and Support

1900 2900 VME/B VME/K

Telecomputing continues to develop TPS as the outstanding tp monitor for the ICL range. We are now planning our new software for VME/B, VME/K, and for intelligent terminals. We got it right with TPS — now is the time to join the small team who will develop and support another winner.

## Project Managers and Consultants

Must have extensive experience in the design and development of online transaction processing systems.

Telecomputing specialises in implementing advanced systems using communications terminals. We operate internationally with every client bringing his own unique system requirements and we need the senior staff to design and develop those systems.

## Applications Design and Programming

Our client services teams continue to expand to meet the growing demand for our software product and project services. We need more experienced programmers and systems analysts/designers. Junior vacancies require at least one year ICL Cobol experience; in more senior positions your specific computer background is less important. All our work is for online systems but you can learn that after you join us. Our teams have already implemented applications such as order entry systems, production engineering, stock controls and mail order. More are in the pipeline. There are opportunities at all levels. Continuous training will develop your skills and promote your career growth.

## Lecturer (Commercial D.P.)

To join a small team providing formal training to our clients. We require an established lecturer in computer disciplines or experienced computer programmer with lecturing skills and strong training motivation. You will not spend all your time lecturing. You will have the opportunity to keep abreast of the latest developments by spending part of your time working with the applications, design and programming staff.

## Software Sales

To sell TPS — the leading software product for ICL communications systems. We are currently taking one order every three working days and need additional Sales Staff to respond to the tremendous demand for TPS and other Telecomputing quality software products. Computer experience and sales motivation are essential; experience of terminal systems and of software marketing are useful but not mandatory. Ideally we would like to meet system designers and programmers who have either moved or wish to move into sales.

## Technical Writer

Responsible for writing, publishing and updating our systems and software publications for TPS online systems; i.e. manuals and bulletins covering systems design, programming, system creation and operating. We require an experienced computer technical writer or an experienced analyst/programmer with the writing skills and motivation to produce quality publications for our clients.

Telecomputing started in Oxford in 1974 and has more than doubled in size each year. We are now providing advisory, training and implementation services for installing online computer systems around the world. We have our own 2904 and a 2950 on order. Our activities are continuing to expand and we shall soon announce a microcomputer display terminal. This year we shall double in size again. When you join Telecomputing you are taking the opportunity to develop your own career in a growth company. We have an informal atmosphere and expect to pay attractive salaries and bonus.

Please write or phone:  
Peter Knowles  
TELECOMPUTING  
Seacourt Tower  
West Way, Oxford OX2 0ED  
Phone Oxford (0865) 723621 (day)  
or 01 865 9094 (evening)

Online Systems & Software  
**Telecomputing**  
Oxford, London, Manchester, Amsterdam



# Software Design & Development

Move your career into the 1980's.  
But do it in 1978.

Our clients are among the world's major investors in research and development. With headquarters in the USA, they are currently designing and developing the communication systems of the future, using sophisticated software and the most modern hardware available, including main frames, minis and micros.

## TWO ESSENTIAL QUALIFICATIONS

We are seeking candidates with a good first degree or postgraduate qualification in Computer Science or Electrical Engineering/Mathematics/Physics with Computer Science as an ingredient. Your experience may have been gained in any environment involving the specification, design and testing of software for real-time systems, and whilst experience related to advanced

## In the USA

telecommunications technology would be an advantage, it is not essential. There are also positions available for candidates with an interest in Advanced Systems Research and Planning.

## THE REWARDS

As a successful candidate you will move ahead in terms of income, life-style, career progression and experience. Above all, you will enjoy the satisfaction of working in a company which recognises the vital importance of systems innovation to future business success: an attitude which is amply reflected in the back-up and rewards the company can offer.

## RANGE OF OPPORTUNITIES

Our clients' offices are situated on the outskirts of a major city with easy access to countryside and lakes. Relocation costs and immigration formalities will be looked after by the company.

We would like to discuss with you the range of opportunities available - opportunities which will enhance your experience, develop your career prospects and increase your earning power.

As an initial step, send brief career details or write or telephone for full details and an application form to: Euroselection, 6-8 Emerald Street, London WC1N 3QA or for an informal discussion telephone Barry Eagles on Brighton (0273) 601699. Your enquiry will be treated in the strictest confidence.

**euroselection**  
Management Consultants

# Live and Learn

No profession is changing as fast as computing. That means exciting career opportunities. But it can also mean problems - for those whose careers fail to develop as fast as the technology.

Data Logic operates at the forefront of computing, applying the very latest hardware and techniques to practical commercial problems. We cover the range from mainframes to the smallest computers. We are leaders in the use of microprocessors for applications that not so long ago required far larger machines. Several of our projects involve dispersed networks of ten or more minicomputers.

The exceptional scope of work is important to our staff. We can match their individual experience to their

projects. Equally, we can ensure that each project adds to their experience. As computing itself develops, so do they.

Over the past year Data Logic has grown from 120 professionals to today's total of 280. Our expansion has meant unrivalled opportunities for career progression. We are not prepared to promote people before they are ready for it. But when they are ready - and we give all the assistance we can - they know that the positions as senior programmer, senior analyst, project manager and consultant will be there waiting for them.

In short, people at Data Logic have some of the most satisfying work you can find. And the extra satisfaction of learning as they do it.

## Project Managers

For mainframe, minicomputer and mixed processor systems, usually supporting terminal networks. Increasingly, Data Logic's turnkey projects involve multiple, separated minicomputers.

Applicants must have at least 5 years implementation experience. They must have managed a sizeable project or have taken substantial team responsibility.

## Senior 2900 System Designer

For consultancy and implementation projects, with a bias towards large ICL 2900 models. Applications will include database systems and communications networks. Extensive knowledge is required of hardware capability, operating systems and standard software. The scope for application of this knowledge and for career progression will be considerable.

## Minicomputer System Designer

For work at the forefront of the commercial application of small computers. The majority of projects will involve data communications and several systems now in their early stages include many interconnected processors. Applicants should have at least 3 years design experience, preferably including system sizing and performance assessment.

## Scientific/Mathematical Programmers

Principally for real time minicomputer systems applied to analysis and/or control in scientific environments. There may also be some problem solving in high level language on mainframes. Applicants should have a relevant degree in the mathematical sciences and one or more years practical experience in assembler or FORTRAN.

## COBOL and PL/I Analysts

For mainframe projects involving a variety of interesting and demanding applications, including banking, insurance, manufacturing and distribution. Applicants should have 3-5 years analysis and programming experience. A sound knowledge of COBOL will be an added advantage.

## Digital Engineer/Programmers

For design and development of systems incorporating custom-built devices such as interfaces and terminals, with an emphasis on the use of microprocessors. Applicants should have a degree in electronics or computer science and have programmed mini or micro computers at assembler or microcode level.

## Programmers - Small Commercial Systems

For implementation of transaction systems on a variety of minicomputers. Ideally, candidates should have experience of RPG1, BASIC, COBOL or FORTRAN applied in a commercial environment.

## Database Consultants

To advise clients on the creation or upgrade of databases and to assist Data Logic teams in the design of retrieval systems. Projects will involve both mainframe and standalone minicomputer configurations.

Applicants should have experience in the design of record structures and have used at least one of the leading database packages such as ADABAS, IMS, TOTAL and DMS/2. Knowledge of banking or insurance is of particular interest.

# Data Logic

Most vacancies exist in our offices in Greenford, Central London, Birmingham and Manchester. Telephone or write, indicating the positions of interest:

For Greenford and Central London, to:  
W. D. Barrow  
Data Logic Limited  
FREEPOST, Watway House  
320 Rutlip Road East  
Greenford  
Middlesex UB8 3BP  
Tel: 01-578 9111

For the Midlands, to:  
A. W. Taylor  
Data Logic Limited  
FREEPOST  
Birmingham B2 4BR  
Tel: 021-632 9530

For the North, to:  
J. Anderson  
Data Logic Limited  
Warwick Gate House  
Stratford Road  
Stratford-on-Avon  
Tel: 081-672 3232

مكتبة من الكتب

# Netherlands

SPL's subsidiary in the Netherlands continues to grow fast and now needs more Computer Professionals.

## We need

\* A minimum of 2 years programming experience and either  
\* a good working knowledge of any major international mini-computer such as DEC PDP11 or Data General Nova.

or  
\* Practical experience of systems software work on any small computing equipment particularly in the areas of I/O handling, disc monitors, assemblers or high level language compilers

or  
\* Experience of industrial systems applications based on mini or micro computers

The total salary package will be very attractive to people at present working in the U.K. and will be in the range of £10,000 to £12,000 upwards. Applications from Dutch Nationals and others working outside the U.K. will be welcome.

If your experience does not fit these requirements but you are interested in opportunities or working overseas with a major British software house please contact us anyway.

Please write or phone:  
Alan Taylor, Resources Manager  
SPL International

12-14 Windmill Street, London W1P 1HF  
01-636 7833 or phone direct Utrecht 315534

## COMPUTER SERVICES..

CWS Computer Group

## Manager National Computer Services

Manchester Based  
c. £9,500

CWS Computer Services satisfies the total data processing needs of the £1,400 million turnover Co-operative Wholesale Society Limited and in addition provides computer services to Co-operative Retail Societies and other commercial organisations through its six regional Computer Service Centres.

Due to expansion and reorganisation a Manager is required to take charge of the six regional centres and to further expand and develop the business.

An extensive knowledge of both the technical and commercial aspects of the computer service industry with a bias towards sales and marketing are essential pre-requisites for applicants. Over and above this however, the man or woman appointed will be required to demonstrate a successful record of management achievement against a background of rapid growth and technological change.

The Group operates ICL mainframes throughout its network comprising both 1900 and 2904 systems. A triple 2960 configuration is scheduled for delivery during 1979 at the Group Head Office in Manchester.

An attractive salary in the region of the figure quoted will be offered plus the usual fringe benefits expected of a leading National Organisation. Contact: P. J. Cropper, General Manager, CWS Computer Services, New Century House, Manchester, M60 4ES. Tel: 061-834 1212 ext. 6820. (office hours) 062-583 789 (evenings).

## COMPUTER SERVICES..

CWS Computer Group



CWS Computer Services  
162 Walton Road  
Liverpool L4 4BA  
Tel: 061-207 0457

CWS Computer Services  
22 Abbey Street  
Nuneaton  
Warwickshire CV11 5BT  
Tel: 0682 384107

CWS Computer Services  
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Barley Mow  
Chester-le-Street  
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Tel: 0832 406321

CWS Computer Services  
Crabbe Street  
Ipswich  
Suffolk IP4 5HT  
Tel: 0473 78616

CWS Computer Services  
100 Morrison Street  
Glasgow G6 6LP  
Tel: 041-429 2100

CWS Computer Services  
Stratford House,  
Station Road  
Godalming  
Surrey GU7 1HH  
Tel: 0482 28212/3



# Communicate with Racal

## VOICE RESPONSE SYSTEMS

### Chief Engineer Hardware

### Head of Systems Software

### Systems Engineers

### Sales Executives

# RACAL

RACAL MILGO, a member of the world famous Racal Electronics Group, is a leader in data transmission techniques, and is now broadening its activities by creating a NEW DIVISION to market COMPUTER CONTROLLED VOICE RESPONSE SYSTEMS, for data entry and file enquiry applications.

The following positions are our initial requirement and the successful applicants will assist in forming the basis of this new and exciting activity.

#### Chief Engineer, Hardware

The person we seek will have a broad background which may include systems or design experience in mini-computing in communications, data entry, retrieval systems or intelligent terminals. Experience with PDP 11 would be an advantage.

He/she will interface with the California-based equipment supplier, and provide the necessary technical expertise on systems and product hardware to the Company and its network of foreign distributors, involving some foreign travel for short periods.

Together with the head of systems software, the selected candidate will direct and support a team of systems engineers, to provide a complete user system facility. Probably aged 30 years and upwards, with a good degree, a strong practical ability, a self-starting approach and the ability to communicate are essential qualities.

#### Head of Systems, Software

The position requires reasonably broad experience, which may include applications programming for batch and real time applications, data entry file enquiry systems, or mini-computing in communications. Experience with PDP 11 would be an advantage.

He/she will interface with the California-based equipment supplier, and provide the necessary expertise on the software aspects of systems and terminals.

The selected candidate will also have overall responsibility with the Chief Engineer (Hardware) for the planning and support of a team of Systems Engineers, and interface with a sub-contract software house. Providing suitable facilities for a network of foreign distributors, involving some foreign travel for short periods.

Probably aged 30 years and upwards, with good practical ability, the right person will be methodical, self-starting and able to communicate.

#### Sales Executives

To sell these systems, two experienced sales executives of proven ability are sought for the South and North of England.

Familiar with the D P environment, a background of consultancy, bureaux, or hardware software sales, required, together with the ability to grasp users' applications quickly.

An attractive basic salary will be offered, supplemented by a commission, based on sensible sales targets. The Northern position is based in Manchester.

#### Systems Engineers

Systems Engineers are sought to take responsibility for the implementation of customers systems and to support the sales teams. These mini and micro-based systems will require a good working knowledge of both hardware and software. The position requires at least two years' minimum and peripheral experience, preferably with PDP 11, in a communications environment. Equipment training will be provided.

Probably aged late 20's, they will have a good practical ability, a mature attitude and be able to communicate with customers, software houses, and field service staff.

The NEW DIVISION will be situated in Reading, Berkshire, and the attractive total remuneration package will reflect the significance of these key appointments.

Please write giving details of experience, qualifications and present salary to The Personnel Officer, RACAL MILGO LIMITED, Prospect House, Thorn Street, Reading, Berkshire.

University of Essex

DEC system-10

## Systems Programmer

in the Department of Computer Science  
Computing Service

Applications for the post of Systems Programmer in Grade Computer Officer 1A (salary scale £3,680-£8,178) are invited. Applicants should have a sound background in the theory and practice of operating systems. The successful applicant will also be fluent in assembly language, interests in distributed processing systems, micro-processors and computer networks would be a distinct advantage.

The successful applicant will join an established Programming Group, which has responsibility for all aspects of software maintenance and development on the University's Service machine. This is a DECsystem-10/70 providing an extensive Timesharing and Batch service.

Applications (six copies) including a curriculum vitae and the names and addresses of two referees, should reach the Registrar (AG/39/CW), University of Essex, Wivenhoe Park, Colchester CO4 3SQ, from whom further particulars may be obtained by July 20, 1978.

## Burroughs Software Programmer

WOKING : £5,225

Due to internal promotion we have an opportunity for a Software Programmer to take responsibility for, and to develop, a wide range of in-house software utilities.

Candidates with Burroughs experience should ideally have a sound knowledge of Cobol, a working knowledge of Assembler and have worked in a data communications environment.

Company benefits include flexitime, free lunches and modern working conditions.

For an application form please contact:



Miss M. Baldock, Personnel Officer  
B.A.T. (U.K. and Export) Ltd.  
Export House, Woking, Surrey  
Telephone: Woking 78111

## HONG KONG POLYTECHNIC

Department of Computing Science

Applications are invited at Principal Lecturer, Senior Lecturer and Lecturer levels for the Department of Computing Science at the Hong Kong Polytechnic. The Department offers courses leading to a Diploma in Computing Studies, a Higher Diploma in Computing Studies and a Higher Diploma in Systems Analysis. A viewpoint to offer more advanced work leading to an Associateship in Computing Studies is now under consideration.

The Department's own courses are, at present, commercially oriented and emphasis is placed on practical work. Students are required to spend a minimum of 15 weeks in a local DP department as an integral part of their course, in addition to undertaking projects and case study work. From October this year, the courses will be offered under a credit-unit system.

The Polytechnic shares computer facilities with the 2 local Universities. Substantial batch processing facilities are available at all 3 institutions and present developments will facilitate the sharing of resources. In addition, at present 100 interactive terminals are available on the Polytechnic's campus alone, and it is planned that this figure will rise to approximately 500 by 1980/81.

Successful applicants will have experience in one or more of the following areas: Advanced COBOL, Advanced Systems Analysis, Systems Data Base Management Systems, Project Management and Control Systems and Computer Organisation.

#### General Qualification for Appointment

Principal Lecturer: (a) a degree or professional qualifications, and (b) an advanced specialist qualification or extensive experience in a specialised field; and (c) substantial teaching and industrial/commercial experience; and (d) proven administrative ability.

Senior Lecturer: (a) a degree or professional qualifications, plus preferably an advanced specialist qualification, and (b) at least five years industrial/commercial experience (about 3 additional years) and (c) proven administrative ability.

Lecturer: (a) a degree or professional qualifications or at least a Higher Technicians qualification in the appropriate field of study, and (b) at least five years professional or industrial/commercial experience or at least three years teaching experience or a suitable combination of professional and teaching experience.

#### SALARY SCALES

Principal Lecturer: HK\$91,740 to HK\$113,340 p.a. by 6 increments  
Senior Lecturer: HK\$74,400 to HK\$100,380 p.a. by 6 increments  
Lecturer: HK\$40,820 to HK\$73,860 p.a. by 11 increments  
Note: HK\$18 68 on 1st June 1978.  
(Commercial salary will be commensurate with qualifications and experience)

#### CONDITIONS OF SERVICE

Appointments will be on fixed-term contracts. Further details of the conditions of service, including pension, gratuity, medical and dental benefits, leave, etc., are available on request. The Polytechnic is a public body and its staff are employed under the Public Employees' Conditions of Service, which are subject to the provisions of the Public Employees' Ordinance, Chapter 113, of the Laws of Hong Kong.

Applications and further information are available from the General Secretary, Hong Kong Polytechnic, Kowloon, Hong Kong, or from the Personnel Officer, Department of Computing Science, Polytechnic, Kowloon, Hong Kong.

## MANAGEMENT POTENTIAL

ANALYSTS & PROGRAMMERS to 6.5k

SURREY, SUSSEX, MIDOX., BERKS

Several of our Client Companies have advised us that they require Analysts and Programmers with management potential.

The equivalent range covers ICL 1900 and 2900 series, IBM 360/370, IBM Systems 3, Burroughs B5000 and PDP 11 whilst the languages include COBOL, PLAN, ASSEMBLER, PLI, RPG and FORTRAN.

Our specialised experience and close contact with leading client companies in the computer field enable us to give you expert personal career guidance about nearly every opportunity in the area of your choice.

Simply phone us and ask for the information - what could be better?

Phone A.B. Executive (Weybridge) 0922 41821 (10 lines).

UNIVERSITY OF BIRMINGHAM  
Faculty of Education  
DEPARTMENT OF CURRICULUM STUDIES

## POST OF RESEARCH FELLOW IN COMPUTER EDUCATION

Applications are invited from suitably qualified persons to work on a project to collect and develop materials for a course in the use of the Computer in Education, to assist in the implementation of suitable principles, packages, and computer at Secondary School level and work students and staff in the Faculty. Experience of work in schools, especially with interactive systems, would be desirable. The appointment is for two years, preferably from 1 October 1978, or as soon as possible thereafter.

Salary on scale £3,660 to £6,178 plus pension.  
Further particulars from Assistant Registrar (Education), University of Birmingham, PO Box 365, Birmingham B15 2TT, or from the Director of Curriculum Studies, University of Birmingham, PO Box 365, Birmingham B15 2TT, would be sent by 15 July 1978.



Metropolitan Borough of

## WIRRAL

PROGRAMMER  
£3861-£4214  
(inclusive of supplements)

To join a team developing systems on a 1903T installation running under Gage 2+. Opportunity for a keen person with the right experience to be involved in financial applications using on-line facilities and data advantage.

Applications from the Director of Finance, PO Box 2, Treasury Building, Chester Road, Wirral, Merseyside, Merseyside, L87 9DD, would be sent by 15 July.

## LOOKING FOR SOMETHING DIFFERENT?

### QUALITY ASSURANCE ANALYSTS SALARY £20,000 P.A. + BENEFITS OPERATIONS ANALYSTS SALARY £25,500 P.A. + BENEFITS

Our client, based in the WEST MIDLANDS, is the Computer Services Department serving a large Group of Companies. They have a current requirement for a number of "DATA PROCESSING PROFESSIONALS," who will be involved with varied and highly sophisticated Commercial projects utilising latest generation hardware.

Vacancies exist for:

### QUALITY ASSURANCE ANALYSTS

Ideally you should have:

- ★ a minimum of 4 years' programming experience with a fluency in COBOL/JCL
- ★ an analysis background, which should have included some involvement with the design and implementation of large systems
- ★ a knowledge of DATA BASE, file handling and STRUCTURED programming techniques

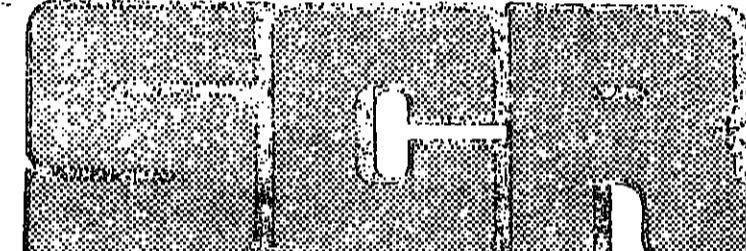
All candidates should have a sound educational background with a minimum of 2 'A' levels, but preferably with an HND or relevant computing qualification.

CAREER prospects within the organisation are EXCELLENT and above average TERMS and CONDITIONS apply.

RELOCATION ASSISTANCE IS AVAILABLE.

If these appointments interest you, then telephone me — Rod BEESON on 021-236 3781 or 021-745 5441 (EVENINGS & WEEKENDS)

SPECIALIST  
COMPUTER  
RECRUITMENT  
LIMITED



ROD BEESON 021-236 3781  
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MANCHESTER 061-835 0427  
Repost, Blackburn House, The Pinnacles, Manchester M3 8BB  
LONDON 01-935 0471  
Repost 6, 102, Blaxford Street,  
London W1F 1JZ

Computing  
Services  
Association

## SYSTEMS ANALYST

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AOC 1125

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to £4,000

London

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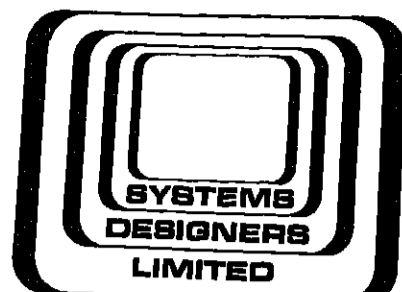
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**Control cabinet for above** including Isolator, stop/start, amperes/volts selector switch and meters and pilot indication of mains healthy, over voltage, etc.  
The equipment may be inspected by arrangement with Mr. G. W. Price, Principal Electrical Engineer at County Hall (Tel. 01-546 1050, Ext. 3988) and written offers should be submitted by not later than 17 August, 1978 to County Supplies Officer (Ref/RL) Surrey County Council, Supplies Department, Blenheim Road, Epsom KT19 9AJ.

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IBM 370	OP	12 mths	CC	2-shift	C. Lon.	£4000
IBM 370	OP	12 mths	DOS	3-shift	C. Lon.	£3800
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Canterbury City Council

## Senior Systems Analyst/Programmer

APB/801 £4343-£5065 (incl.) (pay award pending)

Applications are invited for the above position from suitably qualified and experienced persons. The Council operates an ICL 1801A computer at the present but this is to be replaced in October 1978 with an ICL 2903 using DOS 86 and VDU's linked by a 7602 to the mainframe. The new computer will be housed in a purpose built computer centre on the outskirts of the attractive City of Canterbury. The position offers a first-class opportunity for a computer professional to obtain job satisfaction from working on complete projects and also to become involved in the Council's plans for the implementation of on-line systems.

A Casual User Car Allowance is payable. Consideration will be given to housing, accommodation and a generous disturbance allowance scheme is in operation.

Closing date: 7th July, 1978. Interviews: 17th July, 1978.

Applications may be obtained from the Personnel Officer, 3 Martineau Avenue, Canterbury, Kent, CT1 3DU. Telephone: Canterbury 81748 Ext. 12.

# Data Control Opportunities

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BOC Datasolve operates a large ICL 1900 configuration on behalf of a client in Dartford, Kent. The equipment comprises an ICL 1903A and 1903T operating under manual, EXEC, GEORGE 2 and GEORGE 3.

The Data Control section works on a two-shift basis and the following positions are available.

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To manage a shift of six data control clerks. The need is for someone with skill in dealing with computer users, ideally developed in a bureau type environment, as well as experience in planning and co-ordinating the activities of a data control team. The ability to create and maintain a high level of documentation is important.

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Although initially based at Dartford, these positions will provide opportunities for suitable personnel to progress to other positions, either at Dartford or to other ICL 1900/2900 or IBM sites within the Datasolve organisation.

Written applications, with brief personal details, should be made to Alan Burton-Jones, Regional Development Group.

**BOC Datasolve**

BOC Datasolve Limited, Shipdon Group House, 24 Oval Road, London NW1 7DD. Telephone: 01-267 6157.

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## ANALYST/PROGRAMMER to £5.5K

job in the team dealing with this project, and with the possibility of further progression, telephone Jim Spree, West Malling 845845, extension 2374 for further details and application form, or write to him care of County Supplies Department, The Air Station, West Malling, Kent ME19 6QG.

The County Computer Unit and the Department are located in pleasant rural surroundings near Maidstone. We'll assist you generously with removal expenses.



Kent County Council

Centre Européen pour la Recherche des Cadres

# systems programmer

International banking group in Brussels is looking for a systems programmer to assist with the development and maintenance of real-time financial systems. He is to develop, implement and document systems/application software and to provide technical support for computer operations.

Twin NCR criterions are in use. Applicants are expected to have at least 2 years experience in NCR NEAT-3 and should be familiar with NCR operating systems. Some knowledge of TP and NCR terminals would be an advantage.

Individuals with similar experience on non-NCR equipment will also be considered. Salary offered corresponds to his experience and value with a 13th month and several extra-legal advantages.

Call for more information or for an appointment n° 031/38.0016 Saturday or Sunday from 14 to 16 pm. On weekdays 02/639.04.89 from 9 to 18 pm or write under reference BD/1873 - Systems Programmer.

CERC - rue de Livourne 75 - 1050 Bruxelles

Centre Européen pour la Recherche des Cadres

MANHATTAN

FINANCE DEPARTMENT - HANOR  
**DEPUTY  
COMPUTER MANAGER  
EXPERIENCED  
PROGRAMMER**  
£3,395-£5,085 per annum  
(Stage III award pending)

An excellent opportunity exists for a Programmer Analyst seeking a rewarding post within a large financial department. The Authority currently operates an I.C.L. 1901S computer with discs and paper tape, but is now upgrading the installation to I.C.L. 2904 with EDS 80 and visual display units. The successful applicant will join a small team which will be converting and developing all systems for the new computer. This team will later be responsible for extensive development, especially in the field of communications.

The salary band is deliberately wide as we are interested in receiving applications from people at all levels of experience. If the person appointed has qualities which would command a salary near the top of the scale, he or she would be given the opportunity to fill the role of Deputy Computer Manager. As a general indicator, we are seeking applicants with sound experience in any of the following fields: programming in COBOL and some systems design. GEORGE 1/2 Operating system, 1900/2900 environment, Communications. Local Government background, Applications Manager. Removal expenses and generous relocation expenses will be paid in approved cases.

For any further information, please ring Mr. J. Charlson on Langley Hill 66151.

Applications (no application forms) to be sent to the Personnel Department, Amber Valley District Council, Field Head House, Chesterfield Road, Belper, Derbyshire DE5 1FE, within the next seven days.

**GRAMPIAN HEALTH BOARD**

Post of

**COMPUTER SERVICES  
OFFICER**

The Board wish to recruit a Computer Services Officer on the salary scale £6,955 rising by five annual increments to £8,423 per annum. Candidates should have extensive experience of computing in sizeable installations with the ability to control systems design, programming and operating staff. Knowledge and experience of database management systems and financial and budgetary services are desirable requirements. The duties and responsibilities of the post extend over all aspects of computer services and developments relating to health care services and knowledge and experience of the health service would be a considerable advantage.

Forms of application and further particulars of the appointment may be obtained from the Area Personnel Officer, Grampian Health Board, 1-7 Albany Place, Aberdeen AB9 1RE, with whom completed applications should be lodged by 29th July, 1978.

**LONDON BOROUGH OF HAVERING  
FORTRAN PROGRAMMER**

To join a team working on the development of a machine independent computer managed inventory system used in several UK centres. The Centre has 3 x HP 2100 Computers using RTSA. The successful candidate will join a small friendly professional team and be required to assist with the specification and analysis as well as programming developments. Emphasis is placed upon the ability to work independently, communicate with the team and produce good quality programs in standard FORTRAN IV to agreed deadlines.

AP 3/4 Salary £3,518-£4,289 plus 5%. Phase 3 award expected 1st July, 1978. Application forms and further details available from: The Educational Computer Centre, Three Corners, Romford, Essex RM3 6QX. Tel: 04623 49115. Forms to be returned by 12th July, 1978.

**SHEFFIELD CITY POLYTECHNIC  
DEPARTMENT OF  
COMPUTER SERVICES  
SYSTEMS  
PROGRAMMER**  
AP2/2 (Post No. 263)  
The Sheffield City Polytechnic is the third largest Polytechnic in England and Wales. The Computer Services Department is based on the Pond Street Site campus which is in the heart of Sheffield City Centre. The Polytechnic can offer opportunity for polytechnic to candidates who wish to succeed. Applicants should preferably have a sound knowledge of IBM Equipment, of O.S. V.51 and of Assembly programming. The successful candidate will work in the Computer Services Department and be responsible to the Project Leader for the installation, maintenance and development of systems software on an IBM 370/158.

Salary Scale: £3,599-£4,182 plus 5% award. Requests for an application form to be sent only please, to the Recruitment Section of the Personnel Department, Sheffield City Polytechnic (Dept. C.W.), Halfords House, Farnham Road, Sheffield S1 2TB, to whom completed forms should be returned by 14th July.

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Employment Agency Act No. SE(A2648)

Evening/Weekend, Sara Smith  
Tel: Weybridge 40989

**CONTRACT  
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£150-£300 p.w. + expenses where applicable

370 O.S. Cobol  
H-W GCOS, IDS, Cobol  
Analyst with Construction Industry Experience  
Mark IV Programmers  
290 3 Cobol + Data Base with Fluent German  
Analyst with Inventory Control Experience  
P.L. 1 or Cobol  
370 O.S. IMS Cobol  
1900 Cobol and Paper Tape Experience  
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Hewlett Packard 3000 Assembler  
Analyst with Banking Experience/2903 Cobol  
PL 1 IMS  
Singer 1500 Assembler  
Sys 3 RPG 11  
1900 G111 Cobol Programmers  
PDP Basic  
Cobol, Any Machine + Fluent French

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West Midlands  
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**COMBYTE SERVICES LTD.**  
11 Stamford House, Stamford New Road  
Altrincham, Cheshire

Telephone 061-941 4509  
Evening/Weekend: Dave Hadley 061-440 0408

Employment Agency Act No. NW419



**COMPUTER  
OPERATOR**

Wandsworth

Our client, a commercial Kitchen Manufacturing company, part of one of the country's leading commercial enterprises, is currently using IBM System 3 model hardware, and is seeking a Computer Operator. The successful candidate should have at least 12 months' relevant experience, ideally but not essentially, on IBM System 3.

No shift work is involved.

He or she will join a friendly, young department and benefit from staff discounts on the group's products, a staff canteen, 4 weeks' paid holiday - salary dependent upon experience.

Phone: Colin Shingleton

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Telephone 01-946 4424

**Systems Support Professionals**

ITT Business Systems, European leaders in computer based data communications, need experienced systems support professionals to fill new positions based in their District Regional Offices at Manchester and Kent. You should work closely with the Systems Support Group giving software and technical support to the Sales Force.

We would expect you to have at least 4 years' computer experience, two of which should have been involved in systems and TP application. We would be particularly interested to hear from people currently working as systems engineers or systems programmers in any IBM teleprocessing environment.

We are making considerable impact in the data communications market with our

established 3280 family of interactive terminals, and have recently launched sophisticated additions to our varied range such as the IBM compatible 3805 Programmable Communications Controller. Our salaries reflect the importance of these positions and a choice of Company Car would be given plus excellent fringe benefits. If you are interested in discovering more about these positions telephone Bill Bain, Systems Support Manager on 01-440 4141, ext. 610 or write giving brief career details to Mrs. F. Mason, Personnel Officer, ITT Business Systems, Diversey House, 1A Chalk Lane, Cooksfield Road, Barnet, Herts.

ITT Business Systems



**PROFESSIONAL CALIBRE  
CONTRACT  
BUSINESS SYSTEMS ANALYSTS  
AND  
COMMERCIAL PROGRAMMERS  
(COBOL, RPG, BAL, MARK IV)**

required for

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LONDON-BASED PROJECTS**

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MARGARET DRISCOLL

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**EDINBURGH REGIONAL COMPUTING CENTRE  
DATABASE OPPORTUNITIES**

The Centre has three new posts in its Database Systems Unit for Computing Officers to work with Data Base Management Systems (DBMS).

Currently, the main computing services offered by the Centre are batch services on an ICL 2980, running under VME/B, and OS/MVT accessed remotely at the IBM 370/158-380/85 complex at Newcastle University, and the interactive Edinburgh Multi-Access System (based on a twin ICL 4-75 installation).

DBMS work at the Centre is principally concerned with IDMS, the abbreviation for ICL's Integrated Data Management System. IDMS is an implementation of the database facility proposed by CODASYL and consists of a suite of software components which handle the establishment, processing and administration of a database. At the Centre, a FORTRAN Interface Sub-System (FISS) has been developed (enabling FORTRAN programs to access IDMS facilities), and successful applicants will work on the maintenance and development of FISS on a variety of computers.

Candidates may also like to be considered for a potential post in the Advisory Service with database work as a secondary activity. The Advisory Service represents a focal point within the Centre where users can raise queries regarding difficulties relating to the use of the Centre's main services.

Applications are invited from graduates (or final year students) with some computing experience, not necessarily of any of the above systems. The appointments, which are for three years in the first instance, will be on the Assistant Computing Officer or, for persons with significant relevant experience, Computing Officer scales, with Superannuation under USS. The current scales for Assistant Computing Officer and Computing Officer are £3,180 - £4,601 and £3,660 - £8,178, respectively.

For further details and an application form contact The Secretary, University of Edinburgh, The Old College, South Bridge, Edinburgh 8 (quoting reference 7017) to whom completed forms should be returned by 28th July, 1978.

**LONDON BOROUGH OF  
WALTHAM FOREST  
Borough Treasurer's Department  
Programmers &  
Systems Analysts**

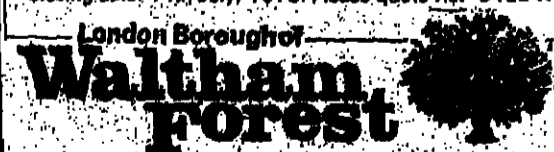
Salary up to £5,350

There are few jobs which offer the variety of computer work that exists within Local Government. Waltham Forest can offer you that variety. We have vacancies in our Systems and Programming division, which uses modular programming under GEORGE 2+. You should be an experienced COBOL programmer, and opportunities exist for an ambitious person to gain experience in the systems field.

A 38-hour week with flexible working hours is in operation, no shift working and 4-5 weeks annual holiday depending on experience.

For further information telephone Ray Brown (0.30 a.m. - 6.00 Mon-Fri.) on 01-527 5544 ext 234 or telephone 01-527 5599 (24-hour answering service) for application form and further particulars.

Closing date: 14th July, 1978. Please quote Ref. 51284.



**UNIVERSITY OF READING  
PROGRAMMER**

The Computer Centre requires a graduate (or equivalent) with experience of programming in assembly code and a high-level language to assist in the maintenance and development of systems programs under GEORGE 3 on the University's large 1904S.

Salary on the scale £3,189 - £4,601 p.a. Apply giving details of qualifications and experience and names of two referees, quoting Ref. M.E. 48A, to Assistant Manager (Personnel), University of Reading, Whiteknights, Reading RG6 2AH.

**Gemini Contracts  
EURO UK**  
contract opportunities for experienced programmers - Register with an International Software Organisation  
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If you are already a successful salesman within the data processing industry, or feel you could be, we would like to talk to you about high salaries with the industry leader; about a big company benefit package; about possibilities for contact with the most important and largest enterprises in the U.K. and Europe. Above all, about promotion opportunities within the fastest growing software organisation in Europe.

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The Data Base Managers**

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Cincom Systems is looking for you.

## Micro and Mini Computer Systems & Mainframe System Software Development

The UNITED KINGDOM ATOMIC ENERGY AUTHORITY'S ESTABLISHMENT at WINFRITH, which is situated between BOURNEMOUTH and WEYMOUTH in DORSET, has vacancies for:

## SCIENTISTS, ENGINEERS & MATHEMATICIANS

both in the development and application of micro and mini computer systems and in the development and maintenance of system software for mainframe computers.

The Establishment is amongst the largest users of computers for research and development programmes. Currently it has a mainframe dual ICL System 4 computer on site and links for a substantial part of the work to other mainframe computers elsewhere in the U.K.A. There is a continuing programme of updating the Authority computer capability.

Micro and mini computers are used throughout the site, demands for new applications of systems are constantly arising and a front end mini computer system which will link the site terminal network to the mainframes is under development.

For mainframe system software maintenance and development experience of ICL 470 system software would be an advantage. Candidates are normally expected to have good honours degrees in appropriate subjects and suitable post-graduate experience, or to have corporate membership of relevant professional institutions. Appointments will be made to the HIGHER or SENIOR SCIENTIFIC OFFICER GRADES.

H50 Salary Range £4,388 - £5,828 pa

S50 Salary Range £5,614 - £7,380 pa

Housing assistance under normal Authority arrangements will be available to a married officer living beyond daily travelling distance.

Applications to: FREPOST, APPOINTMENTS OFFICER, AEE WINFRITH, DORCHESTER, DORSET, DT2 8DH.

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Areas Preferred: First Choice ..... Second Choice .....

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2. ....	.....	.....	.....	.....
3. ....	.....	.....	.....	.....

Date .....

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## Senior Systems Analyst

To £7,000

HOME COUNTIES

This is an exciting opportunity to join a small team at an early stage in its growth. Plantation Holdings operates a PDP 11/70 at Slarimore providing remote on-line processing to companies both within and outside the Group.

The successful applicant should have a minimum of five years computing experience with the emphasis on production, commercial and financial applications. Two of the first assignments will be for Group companies designing a production scheduling and work-in-progress reporting system. The position will involve travelling to locations mainly in the Home Counties.

This is a senior position with excellent prospects of early promotion. For further details and an application form please contact:-

Ames Personnel, Suite 14, Dryden Chambers, 119 Oxford Street, London, W1R 1PA.

**AMES PERSONNEL** 01-434 1106

**National Coal Board**  
Mining Research and Development Establishment  
The expanding programme of the Establishment covers research, development and testing in all fields of engineering and science. This year the Establishment is recruiting additional personnel to increase the effort in key areas of mine productivity and safety.

As a result of this expansion, there are vacancies for:

## MINI-COMPUTER ENGINEERS AND SCIENTISTS

The National Coal Board has embarked upon a programme of applying computer-based monitoring and control systems to mining operations. This challenging and rewarding field of work is rapidly expanding to include coal face monitoring, coal transport systems, and monitoring the underground environment.

Applicants should be qualified in Electrical, Mechanical or Systems Engineering and have experience of monitoring and control systems. They should preferably be experienced in the use of mini-computers and microprocessors operating in real time.

The starting salaries will be in the range £5,000 to £6,500 according to qualifications and experience. Attractive benefits include nearly six weeks holiday.

Please apply to the Staff and Administration Manager, quoting reference no. 740.

**National Coal Board,**  
Mining Research and Development Establishment,  
Ashby Road, Stanbury, BURTON ON TRENT, Staffs. DE15 0QD.



## THE UNIVERSITY OF LANCASTER

Temporary  
Lectureship in  
Computer Studies

Applications are invited for the post of temporary Lecturer in the Department of Computer Studies. Preference will be given to candidates with experience in data processing, machine-code programming or logic design. The appointment will be for a period of one year.

Further details may be obtained by contacting L64/A1 from the Establishment Office, University House, Bailrigg, Lancaster LA1 4YW, to whom applications (CVs, copies of 3 referees, etc.) should be sent not later than 2 July, 1978.

## SALOP COUNTY COUNCIL SENIOR SYSTEMS PROGRAMMER

Salary up to £8,997 per annum  
(Phase 3 pay award pending 1st July, 1978)

This is a new post to head a small team which will be responsible for the evaluation, development, implementation and maintenance of all systems software.

The Council operates an IBM 370/138 computer with a substantial remote terminal network which provides a service to both County and District Councils. VM/370, DOS/VS and DL/I are in use. A major new development programme is being undertaken, and there will be substantial enhancements to both hardware and software. The successful applicant will play a key role in their development.

Salop has plenty of cheap housing in predominantly rural surroundings, and generous assistance with removal expenses will be given in approved cases.

Applicants will need to be technically competent, highly motivated and driven upon responsibility. Although any necessary training will be given, experience of some of the following would be an advantage: VM/370 and CMS, DOS/VS, POWER/VS and RJE, DL/I, and CICS or other TP monitors.

Applicants should send their CVs and three referees to the County Treasurer, Shrewsbury, Salop, SY2 6ND. Telephone Shrewsbury 222231, returnable by 12th July, 1978.

## MYRIAD APPOINTMENTS LIMITED

Computer Personnel Consultants

## SYSTEMS & PROGRAMMING PERSONNEL

C. LONDON

£4500-£7500

Excellent opportunities exist for people keen to progress their careers within an expanding International Company providing a range of computer services to the oil industry.

The central systems team is responsible for developing group systems distributed to overseas O.P. centres. Major development plans include the introduction of a Database on the IBM 370/125 and IBM System 34 computers at sites throughout Europe.

### ANALYST

To £7500

To design and implement systems, the Analyst will possess a programming background coupled with analysis experience on at least one major system. The person appointed will function as a team leader on certain projects.

### ANALYST/PROGRAMMERS

To £7000

The Analyst/Programmer will hold responsibility for systems pertaining to one overseas subsidiary. Candidates should have a sound COBOL background with proven analysis experience along with the ability to liaise with line management.

### PROGRAMMERS

£4500 - To £6000

Applicants should offer a minimum of 12 months' COBOL on any machine and display a mature approach, being particularly willing to accept additional responsibilities.

The company offers genuine career prospects, non-contributory pension scheme, season ticket loan, LVs and 4 weeks' holiday.

Ref. S1/2908

24-hr. answering service  
Please telephone for a confidential  
discussion or write to:  
30 Fleet Street London EC4Y 1AA  
01-353 0981

## Lift and Crane Surveyors & Head Office Engineers

British Engine is a leader in the specialist field of engineering insurance. It is a subsidiary Company of Royal Insurance and has its Head Office in Manchester. The following vacancies exist:

### LIFT AND CRANE ENGINEER SURVEYORS

Manchester, Reading, Humberdale, Inverness and N.E. Coast

Applicants with HNC or equivalent qualifications should have experience covering the manufacture, erection and maintenance of lifts, cranes and similar machinery. Responsibilities after training will include the examination of lifting and handling machinery to statutory and other purposes. The successful applicants for these positions will be based at home and have the benefit of a Company car.

### HEAD OFFICE ENGINEER

Manchester

Applicants for this position need similar qualifications and appropriate work experience to the above appointments including work on electrical installations, the manufacture, erection and maintenance of lifts, cranes and similar machinery. Responsibilities include the provision of an effective inspection and reporting service and involves training and general supervision of Engineer-Surveyors, together with acceptance of risks and settlement of claims. Flexible working hours and good office conditions.

The work is varied and interesting. Salaries are competitive and include immediate eligibility for advantageous mortgage facilities (3½% on first £10,000) and non-contributory pension.

Please write to Mr J. Barber, British Engine, Longridge House, Manchester M60 4DT.

**British Engine**  
British Engine Boiler and  
Electrical Insurance Company Limited.

### OVERSEAS POSITIONS

Openings presently exist for OPERATOR TECHNICIANS to work in foreign locations on mini-computer based system data processing systems. Successful applicants should have H.N.C. or military equipment, with at least one year's experience working with mini-computers and peripherals.

Send resume to: JANET MITCHELL  
Western Geophysical Company  
288-290 Worton Road, Isleworth, Middlesex



Data Processing Recruitment Consultants

## Mini Programmers & Designers Netherlands

Salary: to £16K

We are retained by a U.S. mini-computer manufacturer to recruit mini-computer Programmers and Systems Designers for its Dutch subsidiary. Candidates must offer three years programming experience specifically on one or more of the following machines:

- DEC PDP 11
- DG Nova/Eclipse
- H.P. 3000
- Nixdorf 800/8700

Whilst in respect of the 'design' positions Commercial experience in a feasibility, design and subsequent implementation capacity is essential. The

Company offers a rare opportunity for career based positions within close proximity to Amsterdam. The package includes periodic project bonuses, sickness, medical benefit and pension schemes, full relocation expenses for either single or married personnel, re-imbursement of initial accommodation expenditure, travelling and site allowances. Additionally there will be an opportunity to relocate to one of the Company's EEC or Stateside operations.

Initial interviews will be held in the U.K. after which short-listed candidates will be asked to spend one day in the Netherlands for final selection.

Ref: 15/4

## Real-Time Software E.E.C.

Salary: £10 - 16.5K + Outstanding Benefits

When it comes to State-of-the-Art Real-time Mini Software our client defers to no one. They are internationally regarded as 'technical frontier pushers' and as a valued project-team member you will share their prestige and acclaim.

To meet a continually phased growth programme our client is establishing several new project teams requiring Consultants, Project Leaders, Analysts and Programmers. The latter will be well versed in

Assembler and the former will either be graduates or have extensive relevant experience in I/O. Willingness to re-locate for a meaningfully extended period to one of the most desirable E.E.C. locations is important. Every candidate will be given to candidates and their families in re-location. Interviews will be held in London early in July and offers made within 7 days.

Ref: 15/3

## IMS Data-Base London + E.E.C.

Salary: to £9K (U.K.) to £16K (E.E.C.)

Our client one of the 'Seven Sisters' Oil Companies has asked Logistix to assist in recruiting a number of IMS Data base specialists up to project leader level and beyond. The only pre-requisite incorporated in our brief is that candidates are able to demonstrate solid IMS Data base skills.

DL/I is of course essential and in combination with PL/I, COBOL or Assembler will be of considerable interest to our Client.

This company is amongst the most advanced and sophisticated users of D.P. and should be regarded for its long-term career potential rather than as a stepping stone to greener pastures. Fringe benefits normally associated with a Major Oil Company are offered together with other rewards of a more unusual nature. These are of course in addition to well above average salaries.

Ref: 15/2

## Mini Cobol — U.S. Bank City of London

Salary: £5.5K - 8.5K + Mortgage

One of the World's most prestigious U.S. Banks with European Headquarters in London and regional offices in numerous European capitals, is expanding its sizeable Data Processing activities by introducing a range of sophisticated Mini computers to enhance their IBM 370/168 systems.

This new phase necessitates the recruitment of numerous senior personnel including Project Managers, Team Leaders, Senior Analysts and

seasoned Programmers under whose combined skill the bank propose embarking on this ambitious project. In particular MINI-COBOL as a programming language is essential and relevant experience possibly in finance or Banking will be especially welcome. These openings will not truly be regarded as jobs they must be seen as career building opportunities.

Ref: 15/1

## Systems Designers + Programmers etc. Cheshire

Salaries: £6 - 9.5K (d.a.e.)

A very prestige client with headquarters in the Home Counties, and regional offices located at Macclesfield, and throughout Europe, urgently requires the following key personnel:

Real-time Programmers, Systems Designers & Compiler Specialists with 2/5 years experience. Of particular interest would be people with relevant experience in one or more of the following areas: Ferranti or DEC with Basis RTLII or Corel, and IBM or ICL with Assembler.

The scope of projects is both broad and demanding and certainly in keeping with the international prestige of this client - you will play an important role in project development and the opportunity to enhance your technical expertise is one of the attributes of working with this reputable group. Fringe benefits are well above average and full relocation expenses will of course be met. Interviews can be held in London or Macclesfield to your convenience.

Ref: 15/5

Logistix, Freepost 32, London W1E 3YZ  
01 491 4636  
(Reverse charges)



Avon House, 366 Oxford Street, London W1K 9HA



## GREATER MANCHESTER

Our clients who are one of the largest retail organisations in the UK are seeking experienced staff for their new hardware to be announced shortly.

SENIOR PROGRAMMERS  
SCALE RISING TO £5,200

You will have had two or three years' experience within a medium to large commercial installation using COBOL and preferably will have been educated to 'A' level standard. One of the programmers to be appointed will also have experience of on-line techniques.

## ANALYSTS

SCALE RISING TO £6,000

Our client seeks graduates with three to five years business systems and computer systems design experience for these challenging positions.

SYSTEMS PROGRAMMERS  
SCALE RISING TO £5,700

Systems programmers with two years low level language experience in a commercial installation will have the opportunity of gaining large system software experience.

Company offers. Discount on goods. Pension Scheme. 17 days Holiday plus statutory re-location expenses will be considered where appropriate.

Ian Bacon, Gemini Computer Systems Ltd  
Roberts House, 80 Manchester Road  
Atrincham WA14 4PL  
Office: 061 441 1222 Home: 061 441 1223

GEMINI Recruitment

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This is where you find the better jobs... on this page... at Gemini Recruitment.

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Now we're the name to come to if you're looking for outstanding job opportunities at any level.

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GEMINI Recruitment

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GEMINI Recruitment

Ascii through the  
Logic Gate

An epic in 32K words, by Richard Forsyth  
Block 4 (His Head On The Chopping Block)

Hex and Cleo have escaped from their captors and stumbled upon a secret hiding place high up in the Sierra Nevada. Meanwhile, back at Sprocket's Hole, there are signs of life.

DAVY Sprocket opened one bloodshot eye. The light hurt. He closed it again. His head was throbbing. A hammer seemed to be pummeling from side to side repeatedly within his skull as if his head had become a giant alarm clock that he couldn't switch off. He tried opening both his eyes.

"Oh God!" he groaned, as the walls of the hut swam into focus then blurred again. He stood up, every joint creaking audibly, and tottered out through the open doorway. Once outside he bent double and vomited violently into the sand.

This afforded him some slight relief. He was able to pull himself together sufficiently to inspect his internal error-log file. It had overflowed after 4,096 entries but there was enough information left to paint a pretty dismal picture of the night before — one "seek fail : re-try" trace after another. His spindles had got completely out of alignment; and it showed. Not only that, spurious index records had proliferated so chaotically throughout his filestore that all the overflow buckets in his master directory were full: his entire memory organisation was in imminent danger of collapse. It seemed that a fault had developed in the virtual address mapping hardware. Only the root segment was unscathed. No wonder he couldn't think straight.

"Oh God!" he moaned again, and, carrying his head like an infinitely precious but fragile work of art, he stumbled back into the hut. After the glare outdoors the dimmer light inside came as a relief. He was able to make out Bootstrap's body, sprawled awkwardly under the table.

Suddenly it all came back to him. The guns. The prisoners. They had gone. "What's going on here?" he called out. "Goddamn it, Bootstrap, get your back-end out from under there!" He shook his partner as hard as he could, but Bootstrap remained oblivious to all sensory input. He had dropped out of real time.

"Cleo!" bellowed Sprocket. There was no reply. Then he remembered Kludge's appointment. Galvanised by fear, he sprang to the window. He could see no sign of anyone coming. According to the digital clock it was 01.000E+02 precisely. That meant Kludge and his team were already late by over half an hour, which was lucky for



him. He bent down and shook Bootstrap once more, without getting any response.

He was not fully aware that to be caught empty-handed by Kludge having let their prisoners escape meant, essentially, the scrap heap. There was nowhere lower to sink than this deserted outpost. He would simply be recycled. Even sweeping the punch room floor would be too good for him after a blunder like this. Desperately he tried to think of some way out. His brows furrowed, in concentration.

"Got it!" His fist pounded the table.

If he could persuade them that Cleo and the Kid had been sprung by overwhelmingly superior forces, there was a slim chance that they might get away with it. Busily he began ransacking the room, overturning the table, smashing the legs off chairs and hurling furniture through the window. He was almost enjoying himself. When he got to the teletype, standing useless in its corner, he pushed it over and leapt up and down on it yelling, "You dumb terminal!" in an attempt to deform its metal casing. But he scarcely noticed it.

So engrossed was he in this wholesale vandalism that, amidst the noise of breaking glass, he failed to notice the arrival of three interested spectators who stood just outside the door staring at his bizarre activities. At last he stood knee deep in wreckage and could breathe a sigh of satisfaction.

"Now all we need to do is tie ourselves up with some rope to make it look really convincing," he said, turning to look for some.

"You can spare yourself the trouble," said one of the visitors, holding out a pair of handcuffs.

Sprocket gasped. He found himself face to face with Inspector Extracode. Behind Extracode was the redoubtable Commander Kludge, flanked by yet a third important looking robot.

Extracode stepped forward and slipped the handcuffs crisply over his wrists.

"I can explain..." began a deflated Sprocket.

"Save your explanations for the trial," interrupted Kludge. "Just tell us one thing: where are Hex and the girl?"

"Well," began Sprocket again, but he never finished the sentence. Worn out by his manic exertions, his memory befuddled by Cleo's random quadratic reshuffling, and with no possibility of connection to the Network for a storage regeneration, he finally succumbed to the onslaught of semantic overload. His eyes glazed over.

"Abnormal job termination," he said in a flat voice. "Processor queue is being reloaded. Please re-submit input."

"Switch him off," ordered Kludge curtly. "He can be of no further use to us. We'll learn nothing here. Our journey has been wasted. We shall return to the Computer Centre immediately."

"What about the one under the table?" asked Extracode.

"If he can revive him he may tell us something."

"Let them both rot," replied Kludge, and strode imperiously from the room, his two assistants in train.

Is this the post mortem dump for Sheriff Sprocket and his deputy? Be prepared for a change of scene in our next issue.

© 1978, Richard Forsyth, RAIN Threshing.

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